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Parliamentary Intelligence.

COMMITTEES ON GAS, WATER, AND IMPROVEMENT BILLS.

HOUSE OF LORDS.

MONDAY, MARCH 12.

(*Before Lord* LYVEDEN, *Chairman, Viscount* DUNGANNON, *Marquis of* LONDONDERRY, *Lord* SALTOUN, *and Viscount* MIDLETON.)

MAIDSTONE, ROCHESTER, AND CHATHAM WATER BILL.

MEDWAY VALLEY WATER BILL.

MAIDSTONE WATER BILL.

BROMPTON, CHATHAM, AND ROCHESTER WATER BILL.

(*Continued from page* 157.)

Mr. *Dugald Campbell* recalled, and examined in reference to analyses made by him since the last meeting of the committee.

Mr. *Pilbrow*, examined by Mr. CHAMBERS.

I am engineer to the Brompton and Gillingham Water Company, and have had large experience, especially in regard to the water from the chalk formation. The company consulted me, in 1856, with reference to the feasibility of supplying water from the neighbourhood at an economical cost. I carefully went over the district, and examined the wells in the neighbourhood. I found that the whole of the town would have to be supplied from wells, as there were no springs there, and reported so to those who instructed me. I considered that, at a particular spot, a copious supply could be obtained by making wells. I found it only necessary to sink a main shaft of 85 feet deep, and run down two adits at an angle of 45 degrees, and through the toes of these I bored 150 feet further down. We went for about 200,000 gallons per day; and, before the contractor was paid off, one condition was that we should obtain that quantity. We obtained that in abundance. We are now sending up from 80,000 to 100,000 gallons per day. We could pump up now exactly 7½ times more water than we do, without increasing our works. Our works could pump up now, in 24 hours, 600,000 gallons, in point of power. We are only pumping about 32 hours per week. I believe the supply of water to be unlimited, speaking practically, because our wells are sunk into the chalk basin, and the supply is not dependent simply on filtration. As far as my own knowledge extends, I consider it one of the purest waters that could be got. I have made a careful estimate of the cost of the extra works which would be required. The parliamentary estimate was £18,000; but I am satisfied the works could be constructed at 25 per cent. or 30 per cent. less. I am about erecting a nominal 50 horse-power engine, with a practical horse-power of 92, the cost of which will be £3000. We have two engines now, of 58 and 25 respectively. Enlarging engine and boiler-houses, I estimate to cost £500. We have a tender for that at £324. We have a tender for the engine at £1500 odd, but it does not include the boiler. We shall accept a tender about £200 higher. Deepening the well, making new bore, &c., about £1000; but I do not think that will be necessary. Of piping, there would be required 4750 yards of nine-inch pipe; and the total cost would be £7977. There would be 230 hydrons, or fire-cocks, £350; sluice-valves, £200; contingencies and compensations, £1500; superintendents of works, £200; enlargement of reservoir, £800, if necessary. These new works will enable us to supply Gillingham, New and Old Brompton, Rochester, and Chatham. It will be a most adequate supply; and I have allowed considerably for the increase of Brompton. The Government have erected a tank at Brompton, at a high elevation, which neither of the other companies could reach. To do so, they would require that the reservoir at Barming Heath should be 100 feet higher. We have a contract to supply it, and the Government have laid out £4000 in the erection of the tank, on that express understanding.

Cross-examined by Mr. JOHNSON: Looking at the height of your reservoirs, you could not arrive at the tank within 4 feet at still water; and, when you put your water in motion, you could not reach it by 50 feet, owing to the friction. The friction or percolation through chalk would be very slow, and that is the reason why I should not rely upon a well which did not tap the fissures: 30 feet per mile is the average fall through chalk, but I have found it as low as 13 feet. At Watford, I find 13 feet per mile. We are supplying a district of 10,000 inhabitants; but all these do not take the water. Our reservoir holds 250,000 gallons. It is 69 feet square, and 11 feet deep, and we do not allow the water to get below 3 feet. By holding the water down at 15 feet, we could pump 300,000 gallons, and we have done so by experiment. The reservoir is a covered reservoir, and the water does not see the light until it is delivered from the tap. I have taken the population of the district at 50,000, and calculated the supply at 20 gallons per head. The Trafalgar wells are sunk to the chalk. After two or three days continuous pumping, it is very likely that the supply in those wells would fail. The chalk there is underneath the London clay, several hundred feet. There is a large bed of sand above the chalk. The case is as different as possible from the Luton supply. I am the engineer to the Gosport water-works. We can there pump a million gallons per day. We have calculated that we can do this upon given data, but we have required to do so practically. We have drawn about half a million gallons in a day, and had many feet still of water.

By Mr. VENABLES: We command an area of about 18 square miles. We don't depend entirely upon the rain-falls. If we should have no rain for ten years, our water would only be depressed by pumping, not by percolating away. It would never be contaminated by brackish water from the Medway at that distance, unless lowered to an extremely improbable depth.

Re-examined by Mr. CHAMBERS: I have have had a very long experience with the dip and character of this district. My experiments have satisfied me of the correctness of my anticipations. The various features suggested with respect to wells, have no analogy to this case.

By Lord DUNGANNON: The works were originally constructed with a view of being ultimately carried further. I have not the slightest doubt of success, or I would not risk my reputation with any company.

Mr. *Beardmore*, examined by Mr. CHAMBERS.

I am a civil engineer. I know the situation of these works, and I think they are in about as favourable a position for a chalk well as could be chosen. It is far enough from the sea to protect the water from becoming brackish. The blue line in the map would show the steady level of the water. I have seen the estimates for the works. The prices are ample.

Cross-examined by Mr. JOHNSON: I am concerned for the river Lea works. The Hampstead well was sunk 1800 feet. They went lower than the water-line in the chalk. Their not finding it, proves that the water-line is to some extent uncertain, and that the quantity is uncertain. This does not quite prove that absolute experiment is necessary in every case. There are some situations in which the supply is certain; in other cases, it is problematical. The Victualling yard at Portsmouth is in one of the uncertain places. The wells probably do not yield 100,000 gallons a day; but I don't know the Gosport wells.

By Mr. CALVERT: I have examined the locality of this well. I first saw it last year, and again, a week or two ago. If 100,000 gallons a day appeared to lower the well about 14 feet, and, if they pumped a million gallons, they would lower it somewhat more, unless they sunk the well further, or made adits in differents directions. This might be done, from time to time, according to demand. With 50 feet more of adit, I believe they would get a million gallons per day; but I would not pledge myself to a foot or two. I don't think it would be necessary to carry them on 100 feet. The supply depends upon the rain.

Re-examined by Mr. CHAMBERS: This is the drainage-bed of a very large district, and the gault is below the chalk. The main portion of the drainage of the district is subterranean. The works at Luton are situated in almost as favourable a state of things as I could have imagined.

Rev. *J. C. J. Clutterbuck*, examined by Mr. CHAMBERS.

I have studied geology a great deal, particularly with the late Dean of Westminster. I have heard the evidence of the two last witnesses; and, with very little exception, I can agree with them entirely. The section coincides with my previous anticipations of what it would be. Some years ago, in investigating this subject, I found that the dip of the water line in the chalk stratum was from about 30 feet to 36 feet or less per mile, and I believe I was partly the means of establishing certain facts in reference to the dip of the water-line, which I was led to examine into, in consequence of a bill for the supply of London, from the neighbourhood of Watford, in Hertfordshire. I find that the water-line indicated on this plan corresponds, to a certain extent, with my own observations. The saturation flows out into the Medway at a mean tide level. As far as I have seen this country, there is no delivery of water by springs over the surface of the chalk. There is a law by which you may ascertain the probable quantity of water which you will obtain by sinking a shaft. It is a simple law of hydrostatics, the same as regulates the outfall of this water at the mean-tide level. If it has been ascertained that, by pumping 300,000 gallons of water from this well, you would lower it 15 feet, a very much larger quantity would be obtainable from the next 15 feet of water. The last 15 feet would give you more than double the first 15 feet.

Cross-examined by Mr. JOHNSON: The fall in the chalk stratum at Brighton, is at least 36 feet to the mile. The effect of a 36-feet fall would be that the water must be 36 feet higher than the well in the direction of the fall, before a drop of water would run into the well. When you pump the water to a considerable depth you create an unnatural level, and would have what Robert Stephenson calls an inverted cone. The well at Hampstead, is a proof that there are certain conditions of chalk in which no water can be obtained. I think it requires a practical experiment before you can tell whether the supply will be abundant, or limited, or will fail altogether. In this case, I presume, such an experiment has been made, and I rely upon the data furnished me by the engineers upon the subject. I believe you can tell, by pumping down 15 feet, what the effect of pumping for another 15 feet will be, by the simple law of hydrostatics. Having ascertained how far the law of hydrostatics is interfered with by the stratification, in any given case, the result is a matter of mathematical and arithmetical calculation.

Mr. *Dugald Campbell* examined by Mr. CHAMBERS.

I made an analysis of the water from the Luton well, nearly twelve months ago. It is one of the purest chalk waters I have ever examined. I had two samples sent to me. The quantity sent first was upwards of a gallon. I do not know under what circumstances the samples were taken out of the well.

Cross-examined by Mr. Calvert: Dr. Clarke's process was employed in softening the water. The second sample was sent me about a week after

the first. I thought the organic matter was high in the first. In the original matter, it was 0·56 organic matter; in the softened water, 0·40. I did not examine the inorganic matter in the second sample.

Re-examined: It is a good, wholesome, useful water. That is the opinion of Dr. Lankester, who is an eminent microscopist.

This was the case for the promoters of the bill.

Evidence was then called by Mr. Calvert against the Brompton and Maidstone schemes.

Mr. *Hawksley* examined by Mr. VENABLES.

I am acquainted with the scheme for supplying Maidstone from Farleigh. I have constructed works on that principle in Nottingham and Derby. The water from the Maidstone meadows, will be chiefly river-water, percolating through the Medway, and also some land-water. The land-water is hard water, and the river-water soft: I understand the length of the culvert joining the wells is about 800 yards. The ordinary quantity that could be got would be one gallon per yard per minute. The culvert would become plugged to a certain extent by the river sand. Under the particular circumstances of the river, I should prefer to pump the water, and filter it artificially afterwards. I do not think there would be a sufficient supply from the wells. The Luton well will supply more than 80,000 gallons per day. I have no doubt it would not be possible to discover the minimum yield, except by pumping. I have avoided chalk as much as possible in my undertakings. The great bulk of the population prefer the soft water as saving both labour and soap. As a water for the table, hard water is more agreeable, but not better for the health.

Cross-examined by Mr. CHAMBERS: Luton is about 1½ mile from the sea. The fact of the hills backing up the well would not influence the flow of the water from the sea into the well. I can give no case at Brighton or Gravesend, where the water gets into the well. The wells do not go sufficiently deep. The wells at Liverpool are in the red sandstone, but that makes no difference. At Maidstone, the land springs going into the well will be over and above the gallon a yard per minute, which I spoke of.

By Lord STUART: After some years, the circumjacent water is drawn from the district, and a well has to depend upon percolation. According to my judgment, the company could never supply a million gallons per day of fresh water. At Brighton, they are getting over a million gallons per day, but the circumstances are very different.

By Lord DUNGANNON: I have no hesitation in saying that the Medway water would be purer than the spring-water. The cost of filtration would be 1/10th of a penny per 1000 gallons.

By Lord STUART: I am not engaged in any way with either of these schemes. I come here under an order from your lordship's committee. I think the Medway river scheme is preferable to either of the three other plans for the purposes mentioned.

Mr. *Simpson*, examined by Mr. BAXTER.

I have had great experience with respect to chalk wells. I have the particulars of seven wells at Portsdown. The supply into them is from the chalk strata in the first instance. The new well at Haslar Hospital produced 64,800 gallons a day. The Navy yard well produces 86,000 gallons. The saw-mill well and the engine well at the Royal dockyard produces 15,800 and 64,800 respectively. Neither of those wells is capable of producing 100,000. The Luton well would probably produce double the quantity which these severally produce. The Southampton well would produce 135 gallons per minute—rather under 200,000 a day. It was formed with a view to supply the town. It failed, because the water was insufficient, and also because the great depth made the pumping too expensive. It was abandoned from the expense. The pumps were obliged to be lowered three times. I prefer river-water, if we can get it pure, and get rid of the prejudices against it. The well at Paris fluctuates very considerably. It is 2000 feet in depth. The Trafalgar wells go down about 114 to 160 feet by pumping hard, in 48 hours. This leads me to believe it is not to be depended on for more than 300,000 gallons a day. The utmost I have ever got from a chalk well was 600,000 gallons a day from the chalk, and 500,000 a day from the springs. That was at Cherry Hinton; and, when we depressed the water 40 feet, we affected wells nearly a mile off. There was much more than 600,000 gallons a day at first, but it dried the adjacent ground, and settled to about that quantity. I have sunk wells right and left at Brompton; Ramsgate, for instance, which is about 30 miles off as the crow flies. We got to brackish water at about 230 feet. At Gravesend, we seldom pump more than 200,000 gallons. If they get 150,000 gallons a day out of the Luton well, they will do exceedingly well, provided it remains a bored well. As to a million, or half a million of gallons, it would be idle to think of it. I should not be satisfied with the reservoir, unless it contained two or three days' supply, as that would be necessary to meet accidents and contingencies. I consider a 12-inch main is not large enough for the supply mentioned. Practically, the delivery of water, by an 18-inch pipe, is double that by a 12-inch pipe. My opinion is, that 30 gallons a head, considering the nature of the supply required in Brompton and its neighbourhood, would not be too great an estimate for this district; but I don't believe they will supply half the quantity required, let them do what they like with the well; or, that any increased expenditure on these works will increase the supply of water. I agree with Mr. Hawksley, that the supply in the sand-well at Maidstone will be very inadequate. At Folkestone, we never exceed 150,000 gallons a day. I should doubt whether the company could get 30,000 or 40,000 gallons per day.

Cross-examined by Mr. CHAMBERS: I think it is a pure delusion to think of getting any considerable supply from the well; and it is a scheme that I would not recommend a client of mine to spend a sovereign upon. I employed adits at Sir William Heathcote's and other places to advantage. The level of water in the Gravesend well is in complete sympathy with the tide of the river. It is possible to go too deep for the water. At Ramsgate, the well is a mile from the sea. Ten miles from the well, there are no hills 200 feet high. The circumstances at Ramsgate are very similar to those at Luton, nevertheless. Hills have nothing to do with the question, for the purposes of this inquiry. I don't know the comparative extent of the Brighton and the Luton downs, but I believe the former are ten times as large as the latter. The Cherry Hinton wells have not fallen off. I have not pumped them to their full extent for the last 11 or 12 months. At Portsmouth, the wells run into the tertiary strata. I have never heard of salt-water being complained of in the well in the Victualling yard at Portsmouth. Assuming the fall to be the same, the Medway valley main and the Brompton main would deliver about the same quantity of water, taking the distance into account. We have an adit at Cherry Hinton, and have opened all the strata. The adit is 20 feet long. The depth of the wells is 45 feet; the diameter eight or nine feet. If the Government make their own reservoirs at Brompton, it would be a consideration in estimating the size of the company's reservoir.

By Lord DUNGANNON: I have no confidence in either of the other schemes.

Re-examined: The only safe guide in sinking wells for a large supply is the contiguity of springs. The reason why the well in the Victualling yard at Portsdown is free from salt, I take to be the fact that there are more ducts in the chalk, and, consequently, a greater flow of land-water which keeps out the sea-water.

TUESDAY, MARCH 13.

Dr. *Letheby* recalled, and examined by Mr. Serjeant WRANGHAM.

Organic matter, not containing nitrogenous matter, is not injurious to health. I have carefully examined the Snodland water.

The CHAIRMAN said it would answer no purpose to reopen the question as to the purity of the Snodland springs.

Serjeant WRANGHAM said the object of recalling Dr. Letheby was to prove that there was no sewerage drainage into the Snodland stream.

Dr. *Letheby* said he had made inquiries on Saturday last, and had found that there was no such flow of sewerage.

Mr. CHAMBERS said he had two or three witnesses who would depose to the alleged deposit.

The CHAIRMAN said the committee did not wish to reopen that question.

Mr. *Pilbrow* recalled, and examined by Lord MIDLETON: The area of the Luton drainage is at least 18 square miles. The rain fall is about 24 inches annually, representing 6,236,640,000 gallons of rain water, or upwards of two millions of gallons per day over the district. This water would be drawn down into the well by our pumping.

Mr. T. CHAMBERS then replied upon the evidence. He contended that Mr. Dugald Campbell's evidence set the matter at rest with respect to the quality of the Maidstone water, and he would not, therefore, trouble their lordships with any remarks upon that subject. With regard to the quantity, the evidence was certainly conflicting as a matter of opinion; but it was very material to remember that Mr. Pilbrow had made experiments; whereas, the witnesses on the other side had not. He relied, however, chiefly on the circumstance that the whole case, having been submitted to their lordships, they could now form an independent opinion of their own. The formation of the strata was highly favourable to the collection of water underground. There was a stratum of ragstone, then a stratum of sand, and then an imperious stratum of gault. The water would, therefore, penetrate through the upper stratum of ragstone by means of the fissures, which were water-worn, and exhibited decided marks of water having freely percolated through them. He contended that the water in the Medway would determine the level of the water in the sand, and that the formation of the country proved, beyond a doubt, that the saturation of the sand proceeded from the surface-water which percolated through the strata into the Medway, and not from the water in the Medway percolating into the sand. Under these circumstances, the supply would necessarily be very great, taking into account the district drained and the amount of rain-fall. But if, on the contrary, the water came from the Medway into the sand, then the supply must be equally abundant, and the filtration would be at once natural and inexpensive. The supply from this source, looking at all these facts, must, without a doubt, be adequate for the wants of the district; for, until the Medway should be drained perfectly dry, (an event which was not likely to happen) the sand which lay contiguous, and which drained the entire district into the Medway, would never cease to yield an abundant quantity of water. As compared with the other schemes, this one had other and important features—viz., the comparatively small expense at which it could be carried out, the short space of time which it would take to erect the works, and the absence of drainage to any other people. The learned counsel then proceeded, in the absence of Mr. Hope Scott, to reply in favour of the Brompton scheme. In this case, also, he assumed that the evidence set the matter at rest with regard to the quality of the water. In respect of quantity, he was willing to set the evidence of Mr. Pilbrow, an engineer probably more acquainted practically with hydraulics in connexion with the chalk stratum than any other engineer in the country, against the statements made by scientific witnesses on the other side. The evidence of Mr. Pilbrow was remarkably substantiated by that of Mr. Clutterbuck, who had arrived at the same conclusions from entirely independent observations. Mr. Hawksley had never sunk a chalk well in his life; Mr. Simpson avoided the chalk as much as possible; and yet the experience of the latter gentleman, when he put himself at Cherry Hinton in the same position as the Brompton company was at Luton, was such as to justify the anticipations of the promoters of this bill, and to warrant Mr. Pilbrow in arriving at the conclusions which he had named. The capacity of the well must be pretty well believed in by the authorities connected with the Government works in the neighbourhood, or they would not have expended such large sums in tanks, which were to be filled from the Luton well alone. As to the likelihood of drawing salt water, supposing they lowered their well, he contended that the well must be lowered at least 100 feet more before there was the smallest likelihood of such a contingency being realized, and that even then they would most likely open the ducts of the chalk more freely, as in the case of the Navy well at Portsdown. Assuming that they were upon an equal footing with the other schemes with respect to the quality and quantity of the water, they had the advantage of having a possessory right, which they were endeavouring to protect against rival incomers, with expensive plans, which were petitioned against, and which would probably involve a considerable expenditure by way of compensation to parties who were deprived of their water-rights.

Serjeant WRANGHAM then replied in favour of the Medway valley scheme. Passing over the Medway river scheme, as utterly abhorrent to the wishes of the population, he proceeded to contrast the merits of his scheme with those represented by Mr. Chambers. He contended that the superiority of engineering evidence was manifestly in favour of the Medway valley scheme, and that this superiority was still further borne out by the practical evidence given as to the actual yield of the springs which he proposed to take. He characterized the plans of Mr. Pilbrow as speculative. Adverting more particularly to the Maidstone bill, he contended that a well of 13 feet deep would be wholly inadequate for the purpose required. The promoters of that bill were restricted by their parliamentary orders from drawing water from the river Medway, which they undoubtedly would be compelled to do if they sunk their well lower than 13 feet. The learned counsel then commented at some length upon the evidence. With respect to the Brompton scheme, he contended the promoters of that bill had not the Parliamentary powers, even if they obtained the sanction of the Legislature to their proposal, to deal with so large a district as they contemplated supplying. To one of the clauses of their Act, there was this proviso:—"Provided, also, that no powers are by this Act granted to the company with regard to those portions of their undertaking to which the (said) book of reference does not extend." The old parts of their works were not mentioned in the book of reference. They had, therefore, no power to raise a shilling under their old deed; they would have to raise the money required under this Act; and the money so obtained could not be applied to the purpose stated.

Mr. CHAMBERS said this was an entirely new and technical objection, which he could answer if their lordships would permit him to do so.

The CHAIRMAN said it was certainly new matter.

Mr. Serjeant WRANGHAM said it arose upon the standing orders.

Lord LONDONDERRY: Do you mean to say that the company will not have power, under this bill, to expend money on their old works?

Mr. Serjeant WRANGHAM: Exactly so. Your lordships are asked to sanction a measure which would disappoint your lordships and the promoters. The learned counsel then commented upon the evidence in favour of the Brompton scheme, and contended that, even by the company's own showing, they could not raise more than 300,000 gallons per day at their present rate, even if they pumped continuously 24 hours a day for seven days in the week. This would only supply a population of 15,000, at the rate of 20 gallons per head, whereas the population of the district was stated by their own witnesses to be 50,000. He maintained, however, that the question, whether the well would supply so much as 300,000 gallons per day continuously, was entirely problematical, whereas the springs at Aylesford had been gauged and their quantities mathematically demonstrated. There could be no objection to the Brompton Company continuing to supply the district they served at present, or such part of the entire scheme as their lordships thought fit; but he doubted whether the company could supply even their own district if the population greatly increased. The learned counsel then briefly answered the arguments against the Aylesford spring, as disclosed in the petitions against the bill, and concluded by calling upon their lordships to sanction the scheme which he represented, as the best and most comprehensive which could be devised to meet the wants of the case.

Mr. CHAMBERS, at the suggestion of the Chairman, then replied to the objection, that no new powers were granted by the Brompton bill to spend money upon the old works. He argued that such would not be the effect of the Act.

Ultimately, it was agreed to refer the question to the committee on standing orders.

Mr. CALVERT then addressed the committee in favour of the Medway river scheme. At the outset, he laid great stress upon the fact that, amidst the conflicting evidence of rival engineers, the committee had, in this instance, the benefit of Mr. Hawksley's testimony, a gentleman who was totally unconnected with any of the companies, and whose opinion was, therefore, the more likely to be free from bias. He argued that, according to the evidence of that gentleman, as given before this and previous committees, the Medway river-water was superior to any that could be obtained in the district, and that, if there were any discoloration in it, it arose not from the presence of deleterious organic matter, but from the green sand through which it passed. The purity and adaptability of the Medway water, if distributed through a proper system of filtration, was attested by the important and impartial testimony of Dr. Spencer, and other eminent chemists. He was perfectly aware that there was a prejudice against the Medway water, but he should be perfectly willing to meet that prejudice by the valuable scientific evidence he had adduced. One valuable feature in the measure he advocated was, that it comprehended the entire district, and another was, that the water, being soft, was far more adapted to the wants of the inhabitants than hard water. With regard to the Aylesford springs, it would be very unlikely that the company would be able to take Cussington and Springhead springs without tapping Tottington; and, if they should do that, they would subject themselves at once to an injunction to put a stop to their works. Snodland stream had turned out to be a contaminated and filthy brook, which nobody, with any sense of smell or taste, would drink, and Hoborough was claimed by a third party, as having been his right from time immemorial. The learned counsel then animadverted upon the Luton scheme, chiefly on the ground of its inadequacy, and concluded by asking the committee to sanction the plan for which he appeared, either in its entirety, or omitting that portion which included the Bromptons and Gillingham, according to the suggestion which had been already thrown out.

The room was then cleared, and the committee remained about half-an-hour in consultation.

On the re-admission of the public,

The CHAIRMAN said that the committee had decided:—

That the preamble of the Maidstone, Rochester, and Chatham Bill was *not* proved.

That the preamble of the Medway Valley Bill was *not* proved.

That the preamble of the Maidstone Water Bill was proved.

That the preamble of the Brompton, Chatham, and Gillingham Bill was proved.

The committee then proceeded with the clauses of the two last-named bills.

THURSDAY, MARCH 15.

(*Before the Earl of* EGLINTON, *Chairman, Lord* LISMORE, *the Earl of* AIRLIE, *Lord* CHURCHILL, *and Lord* TEMPLEMORE.)

DOVER GAS BILL.

Mr. HOPE SCOTT, Mr. BURKE, and Mr. RICHARDS appeared for the promoters, and Mr. JOHNSON, with Mr. CLARK, for the Local Board of Health, petitioners against the bill.

Mr. HOPE SCOTT, in stating the case for the company said, the object of the bill was to increase the capital and amend the powers of the Dover Gaslight Company. The company was incorporated in 1822, and by their Act the capital was fixed at £9000 in £50 shares; and it was provided that if the said sum of £9000 was found insufficient for establishing, completing, and maintaining the undertaking, the proprietors might subscribe amongst themselves a further sum not exceeding £2000. At the time of passing the Act, there had been 179 shares, of £50 each, subscribed, amounting to £8950, and two calls thereon, one of £5 and the other of £10 per share, which had been duly paid up. The company forthwith proceeded in the erection of the Act; purchased land, and entered into contracts for the execution of the works and offices. During the year 1822, the proprietors resolved that the most advisable method of raising the sum required for providing public lamps, would be to increase the shares from £50 to £52. 10s. each, thus making the paid-up capital £9397 10s. Further capital being found necessary, 12 additional £52 10s. shares were issued in 1824, and with the capital so provided, the works were carried on until 1846, when 18 additional shares of £52. 10s. were allotted under the powers of the Act, in the same form as the original shares, and thus the legitimate capital of the company was raised to £10,972. 10s., being within £27. 10s. of the limit prescribed by their present Act. In 1847, the company borrowed £2000 upon mortgage of their works, and the money so raised was expended in improving and extending their works; but that sum had since been repaid out of the profits of the company's business. They had also, from time to time, invested considerable sums of unappropriated profits in the extension of the works, instead of dividing them among the shareholders as dividend. The progress of the company's business would be shown by the diagram laid before their lordships, as having risen from 13,814,000 feet, in 1850, to 33,079,000 feet, in 1859; and the same diagram would show the reduction of price which had been effected by them during that period, interrupted, as it was in the years 1854 to 1856, by a rise in the price of coals, and other materials, consequent upon the war with Russia. The tabular statement, which was handed to their lordships, exhibited the actual expenditure, either upon original purchase of land, works, mains, and plant, or for subsequent extensions, and also the dividends which had, from time to time, been paid to the proprietors. The committee would observe, that the difference between £18,954, which represented the annual expenditure up to the year 1855, and the original capital, which was under £11,000, had been supplied out of the profits of the company, while that expenditure out of profits still continued after that period, but was diminished on the face of the table by a deduction of the borrowed money. It appeared, therefore, that the actual expenditure out of the pockets of the shareholders, from funds which were applicable for dividend, was £15,584. 19s. 7d., in addition to the £10,972. 10s., which was raised by shares, under the provisions of their Act. Taking that expenditure, and applying it to the dividend table, it would be seen that, for the thirty-eight years from 1822 to 1860, it yielded only a per centage of £3. 16s. 3d. upon the sums invested. It was obvious, therefore, that the company had not neglected their duty, in the way of extending their works, in order to pay themselves a large dividend; and, moreover, they had certainly not made any exorbitants charges for gas, either in point of price, or supply, so as to prevent a remarkable, and very healthy growth of the consumption. With regard to one particular item—that of the supply to the public lights—they had actually been doing it at a loss, under a contract which had yet sometime to run. He should be able to show that the price which was paid for those public lamps, after deducting charges for repairs and lighting and extinguishing, which were required under the contract, yielded the company absolutely less than the cost of the gas to themselves. With reference to the supply for private consumption, he should be in a position to prove that, considering the area of supply which, of course, had a great deal to do with the cost of production; it being, of course, much more costly to provide stock plant and material for a small trade than for a large one; and having regard, also, to the price of coal, the charges had been exceedingly moderate. The bill now before their lordships, after reciting the original Act of incorporation, the raising and appropriation of the capital, and the construction of works, &c., and the necessity for enlarged means to enable the company to meet the demands made upon them, stated that it was expedient that they should be authorized to raise the necessary amount by the creation of new shares, that they should be enabled to capitalize a portion of the sum expended by them out of profits, "that the limits of their Act should be defined, and that the powers of the company should, in other respects, be altered and enlarged." In fact, it was now thought better to dissolve, and re-incorporate the company, and to place the constitution of the new company upon the same footing as modern gas companies, embodying the Gas Clauses Act as well as the Land Clauses and Companies' Clauses Consolidation Acts. By sections 7 and 10 of the present bill, the limits of the Act were defined; by sections 8 and 9, the property and powers of the old company were transferred to the new company, with the additional powers now given to gas companies. The capital was fixed at £21,945, subject to increase by the issue of new shares to the extent of a further sum of £18,055, making a total available capital of £40,000. Powers of borrowing were also given to the extent of £5000, with the further power of increasing the debt within the limits of one-fourth of the new shares issued. The quality of the gas was fixed; clauses were introduced for securing the testing of the gas, and also for limiting the maximum charge to consumers. The bill had been modified as now presented to the committee, in some particulars to meet the views of Lord Redesdale, and, in others, to conciliate the Dover Local Board of Health, who, under circumstances which would be stated, were petitioners against the bill. It would be seen, therefore, that the bill proposed to recognize a portion of the expenditure out of profits to the amount of the share capital, but to limit the dividend payable thereon to 5 per cent.; while, as regarded the new capital which they sought to raise under the bill, to the extent of £18,055, it allowed, what was usual upon new capital so raised, a dividend of 7½ per cent. On the A shares, which represented the original capital, the dividend was fixed by the Gas Clauses Act at 10 per cent. These were the general objects of the bill; to him they appeared to be very reasonable objects, and one might have entertained the belief that it would pass without opposition. But that was not so, for the corporation of Dover, acting as the local board of health, had petitioned against it. This character of local board of health was one which only a very few years had been a body corporate; and they seemed throughout the country, in their new dignity, to have been extremely active and busy in many respects, where it would have been better that they should have remained quiet. When the Dover Gas Company obtained power to supply gas to the town, there existed the corporation of Dover, which was unreformed, and constituted a body of commissioners for paving and lighting. They existed under the Act of 1788, and, finding them in possession of the ordinary powers of paving, lighting, and cleansing the streets of the town, the company took powers to contract with them for the supply of gas to the public lamps; and, by the 45th section of their Act of Incorporation, they came under restraints against opening the streets, except with their consent. That applied only, as he believed, to new streets; but was the power which generally was obtained over the company. In 1843, the company made a contract with the commissioners for the supply to the public lights for twenty-one years; which contract was, of course, still in existence. In 1850, the municipal corporation became, under the General Board of Health Act, the Local Board of Health for Dover, and to them were transferred the powers and authorities of the old commissioners for paving and lighting; so that they became the parties with whom the company were bound by contract, with regard to the supply of gas to the public lamps of the town. Things went on quietly enough until 1855, in which year, the company, being obliged to make a further increase of their works, proceeded to erect a new gasholder; and, for this purpose, they purchased some land at some little distance from their works. The Local Board, relying, as he presumed, on the powers of the old commissioners, gave the company notice, not to open the streets for the purpose of laying the necessary main to connect the new gasholder with their works; but the company did not think it right to yield compliance with their request. Upon this, the local board issued forth with the *posse comitatis;* and, finding the ground opened and the pipes laid in it, they buried the pipes. Not satisfied, however, with this, they again came and dug up the pipes, and, with the aid of some 40 or 50 workmen, endeavoured to throw them over the wall into the company's yard. The pipes, however, were not "too many," but too heavy for them—they could not do it. Accordingly, they procured drays and dray horses, and solemnly dragged the pipes to the parish pound, where they impounded them, accord-

ing to his brief, "without fire or water, or any kind of meat." This was what the Local Board of Health of Dover, in the first flush of its power, thought consistent with its dignity or interest, and in vindication of the public law to do; and, he had no doubt it was a very amusing and exciting scene. The company, however, did not think it desirable to summon forty or fifty men to recover their pipes, or to go and get them out of the pound by legal process, but they went to the Court of Chancery and got an injuction, which compelled the local board to restore the pipes, and to allow the company to lay them and complete their works. The company thus obtained a most decided triumph over the authorities of the town in this respect; but, after that period, they had been constantly harassed by the local board. There was a famous instance not many years ago in the City of London, in which a great attack was made upon the then existing gas companies. The scheme was to form a gas consumers' company, in which many members of the leading bodies, and of the corporation itself, took shares. They, at first, formed themselves into a voluntary association without an Act of Parliament, but they subsequently applied to the Legislature for incorporation; and their object was to break up the streets of the city, and lay down mains for the supply of gas, in opposition to the old established companies. It seemed that this model was acceptable to the Local Board of Health at Dover, and a gas consumers' company was started there by, as he believed, a Mr. Moxon, a gentleman who had executed large sewerage contracts for the corporation in their capacity of Local Board of Health. This new company asked the board for leave to break up the streets; but, although the original Act of the commissioners, and the old gas company's Act taken together, gave the commissioners some kind of veto, which, however, was not effectual in 1855 to restrain the company from breaking up the ground, it had not given the commissioners, or their successors, the power to sanction the breaking up of the streets by any one else. A case occurred some six or eight years ago, in which a similar attempt at Sheffield led to legal proceedings, the result of which was, that it was held that the road surveyor, and the people interested in the management of the streets, could not confer that power, their appointment being for the purpose of preserving the roads, and not of rendering them imperfect by breaking them up for the purpose of laying down pipes. The gas company at Dover, therefore, took the liberty of informing the Board of Health that they had made a mistake, and that they were doing that for this new company of theirs which the law did not authorize them to do. However, they laughed at the company, and told them, amongst other things, that Mr. Moxon had a thousand men at his command, and that, with this thousand men, who were probably "navigators," with strong limbs and sinews, he would lay down the pipes, and they might protest as much as they liked. The company thereupon prepared an information, and proceeded in the Court of Chancery to prevent acts which they knew to be a breach of the law. That threat, however, did not seem to have moved the local board, until a case inconveniently in point occurred not long ago. It appeared that, on the 25th ult., the Court of Queen's Bench decided a similar point in reference to a gas company at Longton, which they had before decided when the Sheffield case came before it. The court adopted the principle of the Sheffield case, and decided that it was illegal to authorize a new company, without statutory powers, to break up the streets. That decision seemed to have caused a very considerable abatement in the ardour of the Dover Gas Consumers' Company and their friends; and it would appear that, after that, the local board, being free from the necessary attention which would have been devoted to the Consumers' Company, had leisure to address themselves to the consideration of the present bill, which of course had been lodged in the proper office at Dover. As soon as the bill was lodged, the company offered to meet the Board of Health to consider what provisions should be inserted, with a view, if possible, to get it passsd as an unopposed bill. He supposed that, at that time, they were too much engaged with the Consumers' Company to allow of their even showing the courtesy of sending an answer to the promoters. The Longton case, however, having been decided, and the anxiety they had entertained with regard to the new project being over, a communication was made to this company, and they were favoured with a set of clauses, represented by the little volume he held in his hands, and the nature of which he would presently explain. Whatever their nature might be, it was certain that they had not the merit of originality. It appeared that last year Sir J. Shelley introduced into the House of Commons a bill for regulating the supply of gas to the metropolis, which bill was thrown out by the standing orders' committee; and from that so discussed and rejected bill the local board of health of Dover had no doubt, with the watchful vigilance of some friend in London, extracted the voluminous clauses which they sent to this company. The nature of these clauses, their lordships would see, by a very slight examination of a few of them, and bearing in mind the position with regard to the local board at Dover, and the *animus* which had actuated their late proceedings, they would be able to judge how far such clauses were likely to be for the interest of the promoters of this bill, or for the common good of the public. The first clause stipulated that the company should make no alteration, improvement, extension, or removal of any of their works, without the consent of the local board in writing, under their common seal. This clause, therefore, related not only to the produce of future capital, but to the profit of past capital—in short, to the very existence of the company. The next clause proposed to divide the capital into three classes of shares, and to limit the profit on the second and third to 4 and 7 per cent. respectively, instead of allowing the company 10 per cent., as the general Act did. They also proposed to take away the freedom which the company now had of making agreements with their customers as to supply, and required that it should be done in such forms as the local board might prescribe. One of the clauses related to the purity of the gas, and proposed that, in case certain impurities were detected in it, the company should be liable to a penalty of £100. They proposed also to prescribe the rate at which meters were to be rented, and the rates were such as would entirely prevent the meters being even a source of ordinary revenue to the company. Then they proposed that the price of gas should be reduced upon a report of their auditor who was to be empowered to audit the accounts of the company; in short, they had taken the most objectionable clauses in a very objectionable bill, and sought to introduce them here. The petition which they had presented, alleged that the power which the company sought to alter, extend, and improve their works without the consent of the local board, might prove highly injurious to the health and interests of the inhabitants of the borough. Then it alluded to the popular cry which had been raised of late years, as to gas-works being injurious to health, but the committee would be satisfied, on hearing the evidence, that the works at Dover would have no such effect. But after all, the whole of the points alleged in the petition, were the subjects of clauses, with the exception of one, which was set forth in these terms. "That the Dover Gaslight Company were incorporated for the purpose of supplying the said borough with gas, but the said company have illegally applied a portion of their moneys in the construction of water-works, and one of the principal objects of the said bill is to legalize such illegal application of moneys, and to empower the said company to raise additional capital to supply the deficiencies occasioned by such illegal application of the moneys of the said company." Now the recital in the bill, and also the clauses relating to water, showed that this allegation was wholly groundless, and that not a shilling of the capital of the company authorized by Parliament to be raised for gas purposes had been spent upon the water-works. The circumstances under which the company had supplied water were these. There being a very great deficiency of water in Dover, the company, in 1834, to the great joy of the inhabitants, undertook a supply from certain wells which they had sunk upon their land adjoining the gas works. To do this, they induced their shareholders to subscribe a separate capital; and, for something like twenty years, their's was the only public supply of water to the town. But the local board subsequently constructed works which, he believed, had proved much more costly than they anticipated; still, the effect had been to reduce the profits of the company, especially as they had been prevented by the board from making any extension of their pipes. The company had had some treaty with the local board to take their works; but, being advised that, without being authorized as a water company, the local board could not deal with them, they had struck out of their bill the clause which would have enabled the board to enter into agreements with them for the supply of water. The learned counsel concluded by drawing attention to the form of the petition, which did not pray that the local board might be "heard by themselves, their counsel, agents, and witnesses;" and he submitted that, under the circumstances, the board were not entitled to appear in opposition before the committee.

The CHAIRMAN said the last objection was merely technical, and the committee could not entertain it.

The following evidence was then called:—

Mr. *Robert Hesketh Jones*, examined by Mr. BURKE.

I am one of the managers of the Dover Gas Works, and have been eleven years in the service of the company. I was formerly their secretary, and in that capacity I had the books of the company under my control, so that I am in a position to prove the amount raised by them in shares; and the sums expended upon works, and also the dividends paid to the shareholders. I have prepared a statement which shows these particulars in a tabular form. The capital expended upon the works is £34,057: of which £10,972 10s. is share capital; £7500 has been raised by way of mortgage, and £15,584 set apart from the profits of the company during a period extending over 38 years. The average dividend paid to the shareholders has been at the rate of £5. 3s. 8½d. per cent. upon the capital authorized by their Act; but, taking it upon the additional sums invested in the works, it has been at the rate of £3. 16s. 3d., only. If, instead of investing a portion of their profits in the works, the company had divided the whole amongst the shareholders, they would have paid an average dividend of a little over 9 per cent. They would not have realized 10 per cent. With regard to the price charged by them for gas, I am prepared to say that, during the last 10 years, they have voluntarily made great reductions to the consumers. (Witness referred to the diagram showing the increased annual consumption of gas and the decreased selling prices to private consumers from the years 1850 to 1860, from which it appeared that the consumption which in the former year was 13,814,000 cubic feet at 7s. 1½d. per 1000, had increased until in the year 1859 it was 33,079,000 cubic feet at 5s. 1½d. per 1000.) In 1843, a contract was entered into with the Dover Commissioners for lighting the public lamps, which contract still subsists. We keep a book in which to record any reports which may be made to us of an insufficient supply of gas. I have here the police reports referring to the public lighting, and also a complaint book for the private consumers. From these documents it appears that the number of complaints has been very few. It is utterly impossible for gas-works to be conducted for any length of time without having some complaints. All the recent complaints have arisen solely from the insufficiency of the consumer's own fittings; but, notwithstanding this, they have been very few, and the quality of the gas has been uniformly good. The demand for gas is increasing in the town of Dover. The diagram on the wall exhibits, by black and red lines, the constant increase in the demand during the last 10 years, and the amount of capital employed by the company with the ratio per 1000 feet. The town of Dover is increasing, owing to a new line of railway and the increase in the Government works. It is proposed now to light the castle with gas. Our works are sufficient to meet a considerable increase in the present demand, but not to the extent which we contemplate will be necessary. The capital of the company is decidedly insufficient for the purpose, and we should have been put to great straits, but for the help of personal friends to carry on the works. The object of the present bill is to put the company in a position to meet the increasing demands made upon them, and to limit their dividends on the capital already expended. I can answer for the last few years that the capital expended has been judiciously laid out. Of the £15,584 expended out of profits, we are not allowed by this bill to capitalize more than £10,972, and that is to be dealt with, not as money expended under Parliamentary sanction, but as money lent by the proprietors at 5 per cent.; so that, for the benefit of the town, we are sacrificing £5000 out of £15,000, and receiving only 5 per cent. upon the remainder. The water-works of the company were in operation when I became secretary; but, they have ceased to be productive. This has arisen through the construction of water-works by the Local Board of Health and their supplying the inhabitants at ruinously low prices.

Mr. CLARK; I understood that everything in the bill with reference to the water-works was struck out.

Mr. BURKE: There is an allegation in the petition that the water-works have been a loss to the company which the public might have had the benefit of, if the amount had been expended in gas. I merely want to elicit this fact whether, before the competition with the Local Board of Health, the water-works were profitable?

Witness: Decidedly they were.

The CHAIRMAN: Were these water-works constructed out of the capital of the gas company, or with money subscribed by individual shareholders?

Witness: By the shareholders individually. Each paid a certain sum, and the works were the property of the company.

Mr. BURKE: The company being incorporated as a gas company, found that on their premises they could supply water to the town, and they gave their shareholders the opportunity of subscribing capital for the purpose. The Town Commissioners were glad enough to avail themselves of the supply, and the speculation was a profitable one.

Lord CHURCHILL: Have you an Act of Parliament for the water-works?

Witness: No.

By Mr. BURKE: There was nothing to prevent other parties establishing

water-works if they chose. There were other water-works in the town. Sometimes, when the gas company's profits were small, no dividend was paid upon the water-works. The Board of Health having become competitors with us, prevented our laying down pipes.

Mr. CLARK: Are we to go into this water question? I understood it was all struck out of the bill.

The CHAIRMAN: You do not intend to cross-examine upon the water-works?

Mr. CLARK: No, my lord.

Mr. BURKE: If I have a distinct understanding from my learned friend that he does not intend to cross-examine upon it, I will not go on with the subject.

Examination continued: In our contract with the Board of Health, there are heavy penalties imposed upon us if the public lights are not kept burning, and I may state that the board never fails to fine us to the full extent whenever a lamp goes out, although our lamps being exposed to heavy weather from the sea are very liable to be blown out, and our gas is escaping all the time, so that we are expending as much as if the lamps were alight. I may also state that the local board insists upon another absurd provision—viz.: that on certain nights at the full of the moon, the lamps are not allowed to be lighted at all; and, on three several occasions during the last few months, the police have reported that the town was in total darkness. They also use improper burners, which I have expostulated with them upon; and these are the causes why Dover is so badly lighted.

The CHAIRMAN: Who is the judge whether the night is a moonlight one or not?

Witness: It is arbitrary. We do not light the lamps for three nights before the full moon, at the full moon, and one night afterwards. That is the stipulation which the board put in the contract.

By Mr. BURKE: They are not very friendly to us. I will not say that in their corporate capacity they have tried to form a consumers' gas company, but I know that certain members of the board have done so. The solicitor and secretary of the proposed company is an alderman, and the chairman and treasurer are both members of the corporation. In 1855, we were anxious to lay down a main from our works to a new gasholder which was erected at some little distance, and the corporation tried to prevent our doing so. We gave them notice of our intention, and the town surveyor informed us that we must not do it without special sanction. When we began to lay our pipes, he brought a lot of navvies and filled in our trench. We opened it again the next day, and he brought the navvies back, took our pipes out of the trench, and, having procured some horses, dragged them to the pound. Thinking it was no use to fight these gentlemen with fists, we consulted our legal adviser, took the matter into the Court of Chancery, and the Lords Justices granted an injunction restraining the corporation from interfering with us. They alleged that it was not necessary for the public lighting of the town to erect this gasholder, although they have since given their consent to the Consumers' Company, which never proposed to light the public lamps, to break up the streets. The Consumers' Company has been registered, but is not in operation. The recent decision in the Longton case will prevent them from going on.

The CHAIRMAN: What does "Consumers' Company" mean?

Mr. BURKE: It means this—the consumers amongst themselves say, if we make our own gas, we can supply ourselves at a cheap rate, and can be satisfied with a less profit. The thing has been tried in London, and has been a lamentable failure. The companies amalgamate with the other companies, and sell the public in the end.

Examination continued: Ours is the sole company in Dover at present. We cannot go on supplying the town without further capital. We had the greatest difficulty in raising the last loan.

Mr. BURKE: Looking at the hostility manifested towards you by the corporation, and the fact that some influential members of the corporation are also promoters of a rival company, would you think it right that they should have control over your works?

Witness: I think their lordships will consider as I do, that it would be very undesirable. I know that one of their objects is to do so.

Cross-examined by Mr. CLARK: I am not a lawyer; I am sometimes called half a one. I had the case of the company in the Court of Chancery entirely in my hands with the assistance of the legal advisers in London. I am the manager of the works—there is no such term as lessee. I collect the rents of the company and make gas for them at a certain price. In 1859, when we were supplying 33,000,000 cubic feet, the average selling price, to private consumers, was 5s. 1½d. The average price, including the public lights, was considerably under 5s. We have recently announced a reduction in price to private consumers, from 5s. 10d. to 5s., subject to certain discounts which will bring the net prices down to 4s. 10½d., 4s. 9d., and 4s. 7½d. per 1000—the average being at, I calculate, 4s. 8½d., or including the public lights somewhat less than 4s. 6d. We have had very few complaints with regard to deficiency of supply. I never heard that there was a complaint a few weeks ago, that all the lights in the most important parts of the town had gone out. I can explain the circumstance referred to. It was in the month of October last; we had laid down a large pipe connected with our new gasholder directly into the town, and had placed a governor upon it. As we worked a higher pressure on the Saturday evening and the governor was an untried one, it became blocked, and hence put out a certain number of lights, but the defect was immediately remedied. I rather think it occurred on two Saturdays. We thought first of all that the gasholder hung; but, when that was attended to, it continued, and then we found out and remedied the evil. There have been no complaints lately of the offensive character of our works. There were, some years ago, at the time that we ran the whole of our ammoniacal liquor into the sea. Since then, we have converted it into sulphate of ammonia in closed vessels; we have also covered our tar-tanks, and the works are now carried on in such a way as to be the least possible nuisance. We purify our gas by using sulphuric acid to fix the ammonia, by oxide of iron, and by dry lime. The oxide of iron, after being used, is exposed to the air at the works under the cliff. There is no smell from that operation; there would be if we did not use the sulphuric acid to fix the ammonia. I say that we have been harshly dealt with by the corporation who have mulct us in heavy penalties. The fine exacted under our contract for every lamp that goes out is 3d. per night, and during the last six months the penalties amounted to £2. 16s. The number of public lamps lighted by us is just over 400. I can state what the per centage is. Taking the last six months, I find from the police reports that 254 lamps went out during that period, which includes the particular case referred to. One night, there were 26 blown out by the wind; and, on Dec. 31, there were 34 out from the same cause. The proportion of casualties does not amount to 1 per cent. I know it is common to have penalties in contracts for public lighting, but they are seldom inflicted. The corporation pay us about £800 annually for the public lamps. The Vice-Chancellor, Sir Page Wood, refused the injunction in the first instance and referred us to a Court of Common Law on the question, whether, if a right were given to us once to break up the streets, we might not always do it. The price which the managers receive for supplying the gas to the company at present is something like 3s. 2½d. per 1000. For that, we make the gas and deliver it to the consumers, and pay for management, wear and tear, collection, bad debts, and everything. The price of coal at Dover now is 16s. per ton; delivered at the works, it costs us 16s. 9d. We are are taxed 1s. 7d. per ton by the corporation. We are now getting a better price for coke than we have for some years past; it is about 9s. per chaldron. We get a sale for our sulphate of ammonia at £12 per ton. There are no other products of manufacture upon which we get a profit; it costs us something to get rid of them. In some places, they sell their waste lime, but we have to pay to have it removed. We do not get much for tar. The quantity produced is about 10 gallons per ton of coals; we sell a little of it at 2d. per gallon. We use it principally as fuel.

Re-examined by Mr. BURKE: Our proposed reduction in the price of gas is to come into operation on the 1st of April. The price we now get for manufacturing and supplying the gas is 3s. 4d.; after the reduction, we shall get 3s. 2½d. My experience during the last ten years goes far to prove that in conducting gas-works it is absolutely necessary to have a margin in price. The diagram will show that we had to increase the price in 1854 and 1855, owing to the enormous rise in freights and coals in consequence of the war. Although we have shown a tolerably progressive decrease in the charge to our consumers, yet from circumstances over which we have no control, such as the advance of coal and iron, and a rise in the rate of wages, we may have to do the same again. It is the universal custom in Acts of Parliament to allow a margin for such contingencies. I am aware that last year the maximum in the City of London Gas Bill was fixed at 5s. In reference to the public lamps, after deducting for lighting, cleaning, and extinguishing, we only get 2s. 3d. per 1000 feet for batswing, and 1s. 6d. for three jet lights. We should have no objection to equalize the price to that paid by private consumers. So long as we continue to supply the public lights at so low a price, we cannot give the private consumers the reductions we should otherwise do; the contract is a millstone round our necks. When the corporation laid down their large water main, they so disturbed the soil as to create a large amount of leakage in our pipes. It was fearful, and extended over two or three years; we are now just recovering from it. We never received one farthing compensation from them for the damage done; they repudiated the whole of it. We have very heavy gales sometimes in Dover, especially from the south-west, during which the men can scarcely light a lamp along the sea shore. In those cases, we have always had the full amount of penalty inflicted. When we ran our ammoniacal liquor into the sea, it was not through an open conduit but through a gas-pipe. We altered that state of things about five years ago. We now manufacture it into ammoniacal salts, which is an article of merchandize. It is a costly manufacture carried on by a partner of mine at his cost. I can state from experience that it is a loss to manufacture it. When we applied to the Vice-Chancellor respecting our pipes, we were told that our remedy was at common law, but the Lords Justices took another view of the matter, and granted an injunction. We use coke as fuel.

By Mr. CLARK: The water-pipes were laid down for the corporation by a contractor. We did not sue him for damages.

Mr. *George Anderson*, examined by Mr. RICHARDS.

I am a gas engineer, and have been engaged in the construction and management of gas-works for a considerable number of years. I am partner with the last witness in the management of the Dover Gas-Works, and have been connected with them since 1856. We have reduced the price of gas three times within the last three years. There has been a very rapid increase of consumption during that period—from 25,000,000 to nearly 35,000,000 cubic feet annually; and the increase continues in more than equal ratio. The new buildings in prospect, and the additional railway to the town, will further increase the consumption, and it is absolutely necessary that we should have additional capital to meet the necessary expenditure. I think the amount asked for in this bill is very reasonable. Hitherto, the capital of the company has been excessively low, as may be judged from the fact that the proprietors have had to invest profits, instead of dividing them. We cannot keep pace with the demands made upon us, unless our apparatus is sufficient. My experience as a gas engineer convinces me that it is necessary that companies should have a margin allowed them beyond the price actually charged by them, so as to provide for contingencies, and it is always allowed by Parliament. The Imperial Company charge 4s. 6d, and they have a maximum of 6s. The City of London charge 4s., and their maximum is 5s. The effect of the Russian war was to increase the price of coals to us about 25 per cent.; and a war with France would have a most serious effect upon us; but I expect more from the French treaty than from a French war. The coal owners are now holding out for higher prices, and freight, which has been moderate, is now rising. I agree with Mr. Jones as to the insufficiency of the burners used by the local board for the public lamps at Dover. I consider that the town, looking at its importance, is disgracefully lighted. The class of burners employed are those which are used in Scotland, where there is a very high quality of gas; or in stables, where only a small light is required; but they are totally inapplicable to street lighting. I have shown the committee of the corporation, by experiments, that for the gas consumed they do not get half the quantity of light they ought to have, and that they would have if they employed suitable burners; but they have not altered them. In some streets, where we have got the inhabitants to complain, batswing burners have been substituted. Our works are situated at the extreme east of the town, under the cliff, which is 120 feet high, perpendicularly, against us. It is very difficult to get a site for gas-works in Dover better than the present one, as the town is so hemmed in with cliffs. It would be injurious to put them on higher ground, as we should then have to increase the pressure, which would lead to increased leakage, and we should have to charge a higher price for gas. The proposed consumers' company talked of erecting their works about a mile out of the town, close to the poor-house, and the guardians petitioned against it. I may say that that is the direction in which the town is likely to extend, as it is low ground. I am quite sure that our works are carried on without nuisance to the town. The purification of the gas is under my direction, and I have had experience in this matter in London, where the Nuisance and Smoke Prevention Acts are rigidly enforced. We have introduced the same process at Dover, because we think we ought to make no nuisance where it can possibly be avoided; and I believe the introduction of the improved system does not increase the cost of gas-making. The process I adopt is this: I first employ sulphuric acid, to fix the ammonia, which ordinarily flies off. I then send the gas through peroxide of iron, and I use dry lime to take off the carbonic acid. All this is done in closed vessels, and there is far less nuisance than where a more slovenly process is adopted. Some companies do not think it worth while to use the dry lime; but we are anxious to have a high class gas. In consequence of the

volatile matters being fixed, there is scarcely any smell when the lime is taken from the purifiers. It is simply carbonate of lime, which has no smell.

By the CHAIRMAN: The lime is changed every day or two, according to the season of the year, and the quantity of gas that is made. An inexperienced person would call it pure lime.

By Mr. RICHARDS: The manufacture of sulphate of ammonia from the residuum is in my particular province. We get £12 per ton for it, and make a small loss by it. About six years ago, complaint was made that a nuisance was created by our putting the ammoniacal liquor into the sea. I believe the nuisance was created by the drain from the barracks; but we made arrangements to remedy it. I have read the clauses proposed by the opponents of this bill to introduce in it, and I think it would be almost impossible to carry on the gas-works, if those clauses become law. I do not think it would be practicable, in the conduct of the works, for the local board to interfere whenever an alteration was required in them. Similar clauses to these were attempted, last year, to be introduced into a bill for regulating the London gas-works, and I believe it is to be attempted again. The clause requiring that the pressure should be kept up to 10-10ths is a very absurd one, and shows the utter inexperience of those who drew it. The effect, if introduced, would be to raise the price of gas all over the town; as to keep 10-10ths in the lower parts would require that it should be very much greater in the higher districts. Consequently, the leakage would be very great, and the price must be increased. It would also be a great nuisance to the consumers, as a great deal of unconsumed gas would escape, and blacken the ceilings. Five-tenths, behind an argand burner, would be a very good pressure; but 10-10ths would be an excessive pressure, and would have a very injurious effect. It means, a pressure of gas sufficient to displace a column of water, acted upon by atmospheric air, one inch; and, to give that pressure all over the district, a much greater pressure must be given in some places. At the works, it would require to be 40-10ths, which would be a very absurd thing indeed.

Cross-examined by Mr. CLARK: It would be imprudent to erect gas-works on any other site in Dover. Ours are situated about 100 yards from the houses on the Marine Parade. I believe the proposed site of the Consumers' Gas-Works is Buckland Bottom. We did not choose the burners for the public lamps; we merely light those provided for by the contract. By the wish of the inhabitants, we are gradually getting these burners displaced for batswings; but it is a very great struggle. For the quantity of light they give, they burn more gas. We get 2s. 3d. per 1000 feet for batswings, and 1s. 6d. for the other burners. In each case, it is a loss to us; in the latter, the loss is greatest. We could reduce the price of gas to the public 4d. or 5d. per 1000, if we had a fair price, such as other towns get, for the public lights. Our present price is certainly a matter of contract with the local board; but we were forced into it under great pressure, and a threat of new works. The contract was dated 1843, and it was, unfortunately, for twenty years, at those unremunerative prices. It was existing when we went there. In the system of purification which we adopt, the sulphuretted hydrogen in the gas becomes chemically combined with the oxide of iron, and another substance is formed. No nuisance is created by exposing the sulphuret of iron to the atmosphere, for the purpose of preparing it to be used over again. The bill, in which I said the clauses now proposed were attempted to be introduced last year, was rejected on standing orders. The clauses were never considered by Parliament. I say that a pressure of 10-10ths would cause an unnecessary waste of gas. We do not require a different pressure at different parts of the town; but, from the nature of the business, we necessarily have it. We vary the pressure, of course, during the evening, according to the consumption. In London, I believe the heaviest pressure is 15 to 20-10ths; it ought not to be more than that. I am partner with Mr. Jones in the management of the Dover works. Through the arrangement of the company with us, the price has been reduced to what it is. The fact is that, in all the towns round, where the companies manage their own business, the price is from 9d. to 1s. beyond ours.

Re-examined by Mr. RICHARDS: The pressure on the mains is increased when all the shops are lighted, and the demand is greatest. The pressure at the works is no test of the pressure of the burners. In reference to the purification of our gas, I have no hesitation in saying the mode adopted is second to none in London, and is superior to very many. The houses on the Marine Parade were built after the gas-works were erected, and they are let to the same parties year after year. There was never any complaint of nuisance to them from the works until now. The three jet burners, which the corporation use, and which do not give more than a third as much light as the batswing, were not introduced into the contract by us.

Thomas G. Barlow, Esq., examined by Mr. RICHARDS.

I am a civil and consulting engineer, and reside at 42, Parliament Street. During the last thirty years, I have been extensively engaged as a gas engineer, and in the construction of gas-works, and have had very large experience with regard to the cost of manufacturing and supplying gas in towns. I have been acquainted with the Dover Gas-Works upwards of twenty years. In 1856, I was consulted professionally by the company. At that time, they were in considerable difficulties, in consequence of the damage done to their mains by the laying down of the water-pipes of the corporation, and the construction of sewers in the town. I was then first concerned for them. At that time, their leakage of gas had increased from 3,851,000 cubic feet, which it was in 1854, to 8,017,000 cubic feet; and, in the following year, it was still further increased to 9,736,000 feet. The effect which this waste had upon the cost of manufacturing their gas, was to increase it to 4s. 0·88d. per 1000 feet. In that year, they appointed me their consulting engineer, and I have since made quarterly inspections and returns as to the state of the works. It has been a part of my duty also to certify annually for the extensions made by the company. The extensions since 1856, which I have thus certified, amount to £5728. There have been payments made since then for works commenced before my connexion with them, and also of £1000 for the purchase of land, with which I had nothing to do. I consider that the increased capital, which the company now come to Parliament for, is a reasonable amount. The company have adopted the most perfect means which are known for the triple purification of their gas—viz., one for the ammonia, one for sulphuretted hydrogen, and one for carbonic acid. The exposure of the oxide of iron to the atmosphere, after being used to absorb sulphuretted hydrogen, is not attended with any nuisance whatever. When sulphuretted hydrogen is absorbed, the oxide of iron becomes sulphuret of iron; and, if this is exposed to the air, decomposition takes place. The iron becomes again an oxide by the absorption of the oxygen from the air, and the free sulphur remains behind in the mass, augmenting the bulk, so that in time it becomes necessary to throw it on one side. There is not the slightest nuisance created by this process—indeed, there is nothing to cause a nuisance. The sulphate of ammonia, prepared from the ammoniacal liquor, is a valuable product. It varies in price, and sometimes is so low as hardly to pay the cost of production. The process of purification carried on at Dover is precisely the same as that adopted in the City of London Gas-Works, except that, I believe, in the latter they do not use the third process—the lime.

Mr. RICHARDS: I beg your pardon—they do use it; it was expressly stated so here last year.

Witness: I was not aware of that. With regard to the emission of smoke from the Dover Works, I can only say that I never saw any. They have adopted a very excellent system of furnaces, which burn the tar very economically, so that no nuisance is created thereby. I do not know of any better situation in Dover for gas-works than the present one; the prevailing winds would carry the products of combustion off to sea. It is a great advantage to gas-works to be situated on low ground, as these are. With regard to the value of land in the locality, I know that the company, under my advice, purchased, two years ago, about 750 square yards, for which they paid £1000, or at the rate of £6000 per acre.

Cross-examined by Mr. CLARK: The prevailing wind at Dover is from the south-west, and the wind blowing in that direction would carry any emanations to sea at once. In London, sulphate of ammonia is not generally made at the gas-works, but I believe it is in one or two cases. The manufacture of it is not a noxious process; there is no escape of sulphuric or sulphurous acid, and I never heard of complaints being made that it was unpleasant to those who reside in the neighbourhood.

Re-examined by Mr. RICHARDS: The whole of these questions relating to the purification of gas were gone into very minutely, last year, when the City of London gas bill was before Parliament, except so far as the manufacture of sulphate of ammonia is concerned. I believe the London companies have no room for carrying on that manufacture. There are two or three manufacturing chemists, who purchase the ammoniacal liquor from the companies in London at so much per butt, and remove it from the the works, to manufacture it into sulphate on their own premises.

William Odling, Esq., M.D., examined by Mr. RICHARDS.

I am a Fellow of the College of Physicians, Professor of Practical Chemistry at Guy's Hospital, a Fellow of the Royal Society, and officer of health to the Lambeth district. As an officer of health, I have of course paid considerable attention to sanitary matters. I am acquainted with the process of gas manufacture, and have been employed by the Government from time to time to examine and certify as to the condition of gas-works. Of late years, very considerable improvements have taken place in the mode of purifying gas. I have heard the evidence as to the method adopted by the Dover Company, which embraces the most recent improvements. I am acquainted, also, with the works at Dover, and the way in which they are conducted. There may be a little difference of opinion with regard to details, but it is decidedly one of the best conducted works. The residuum produced by the method of purifying by oxide of iron, is certainly not calculated to be a nuisance. The plan adopted at Dover, as far as purifying with peroxide of iron is concerned, is the same as that adopted at the City Gas-Works, and which was gone into before Parliament last year. I agree with what Mr. Barlow said, with reference to the lime process; it is no nuisance whatever; it is lime when first used, and it becomes chalk. If you take up a handful and smell it, it would smell of gas; but, if you passed a heap of it on the road, you would perceive no smell. The smoke produced from these gas-works is ordinary smoke, and there is not much of it. There are about 58 retorts in use, which is not more than one-fifteenth of the number in use in the City Gas-Works, and, moreover, they are short retorts. When coke is drawn from retorts, and water is thrown upon it while it is at a brilliant heat, the steam produced has a certain disagreeable smell; but the practice adopted in this and the City Gas-Works is to allow it to cool a little before water is thrown on, and then the steam is not offensive. The situation of the works at Dover is a very good one, as regards lowness; it is comparatively open, and is favourable for the supply to the town. The City Gas-Works, with a thousand retorts in use, is surrounded by houses, and in the immediate vicinity of the Temple.

Thomas Hawksley, Esq., examined by Mr. RICHARDS.

I am a civil engineer, and have been largely consulted in reference to gas-works. I am acquainted with the works at Dover, and saw them about a week ago. I then examined the mode of purification adopted there. I think the situation of the works, for the distribution of gas, is very good—far the best that could be selected. Dover is entirely surrounded by high cliffs, and there the ground is ascending. It may be taken as a general proposition, that low ground is advisable for the purpose. The system of purification which they adopt embraces all the improvements which chemistry has introduced, which are really useful. There is certainly no ground for fear that the works will become a nuisance to the neighbourhood. I ascertained, by paying particular attention to the subject, that they really are no nuisance. There is no evidence of the escape of sulphuretted hydrogen, which would have made itself apparent on the paint of the houses in the neighbourhood, producing a peculiar glossy blueness. I examined the proposed site of the Consumers' Company's works, which would not be so good as this company's. The gas would have to be supplied down hill, which is a disadvantage; and the distance from the centre of the town, where the greatest quantity of gas is consumed, would very much increase the price.

This was the case for the promoters.

Mr. CLARK said he appeared on the part of the Corporation of Dover, who were also the Local Board of Health, and had charge of all the sanitary affairs of the town. They considered it their duty to come before their lordships to ask that such clauses should be inserted in this bill, or that the bill should be so dealt with as that the gas-works should not be that which they had been to the present time—a decided nuisance to the town. Mr. Hope Scott, in opening the case, yesterday, told the committee that there was a great mass of clauses about to be thrown at the promoters; and he (Mr. Clark) could not help thinking, from the fact that Mr. Barlow, Mr. Hawksley, and other gas engineers having been called, that the company were anxious to fight some question of the general provisions in reference to gas-works, upon the question of the preamble of the Dover bill. Now, he did not propose anything of the kind; and he felt that, if he did, he should be doing nothing for the interests of his clients. He proposed to confine himself simply to the suggestion of such changes in the preamble and clauses of the present bill as he believed were absolutely necessary for the advantage and comfort of the people of Dover. Their lordships would have had their attention called to the situation of these works, which no doubt, as Mr. Hawksley stated, were very favourably located for the distribution of gas with the least amount of pressure; and, for the distribution of gas, it was perfectly immaterial whether the works were situated in the best part of the town—whether they adjoined the best houses, and were a source of nuisance and annoyance to the inhabitants. The only question, as far as distribution was concerned, was level. No doubt, when these gas-works were first established, Dover had not extended as far as it had at present. Like other places on the coast, the best houses had extended along the sea.

shore, and now there were a considerable number of residences beyond the works of the company, on the east cliff, to the residents in which they were a serious nuisance. It might be perfectly true that the managers of the company used the last modern inventions in the manufacture of their gas, and that they purified it as well as other people did. He was not going to say that he could prove they had been guilty of any culpable negligence in the course of their operations, but he would say that, whatever process they adopted, he should prove the works were decidedly a nuisance in the neighbourhood—that they depreciated the character of the property, and produced such offensive smells that people could not open their windows, and, therefore, that it was not for the interest of the town of Dover that the works should be increased in this direction. The company proposed to increase their capital because they contemplated a larger supply, and, if so, the nuisance from the manufacture of gas in this locality would be correspondingly increased. Now, the local board of health maintained that there ought to be no extension of the works here, because, though it might be convenient for distribution, it was not the best place for the manufacture of gas; and that a far better site could be found outside the town, at a place called Buckland, where, though there was a slight rise, there would be no difficulty in sending the gas manufactured there to the gasholder, which the company already had erected at a little distance from their present works. But, if it were decided that the company might increase their works in this locality, then he said it should be done as proposed by the opponents of the bill, under the control of the corporation, or some engineer appointed by them. At the present time, as he had stated, they were a great nuisance, and the petitioners could not but apprehend that, if increased, they would still further injure the property, and be prejudicial to the interests of residents in this part of the town. He thought, therefore, that what the engineer of the company called an unreasonable proposition, was a most reasonable one, and such an one as would meet the approval of the committee. It might be true that in the case of many other towns no such provisions would be introduced; but then, he contended, there was no other instance in which gas-works would be found situated in the best part of a town. Supposing this bill should pass, and the works, as was anticipated, become a greater nuisance than they had hitherto been, how were the authorities of the town to deal with them? It was said they might prefer an indictment, but if they did, what would the answer be? Why, that the company were before Parliament in 1860, and, though it was pointed out to the Legislature that the company was then a nuisance, they obtained the additional powers which they asked for. Notwithstanding, therefore, that many persons in the neighbourhood might be suffering in health from the existence of these works, it would be impossible to secure a conviction against them. He submitted, therefore, that they ought not to receive the sanction of Parliament to increase their works in this locality; or, if they did, it should be done under the control and direction of those who had charge of the sanitary regulation of the place. Upon the preamble of the bill, that was the principal matter to be urged. They proposed by their bill, that the powers of the company should be altered and enlarged; and there was a clause which provided that they should have power to extend their present works, and to erect additional ones. This was the point he must, in the first place, insist upon; and there were then several provisions to which he should have to call attention, as they came under the consideration of their Lordships, such as the management of the works, and the price at which gas should be sold—questions which did not affect the preamble. It would, perhaps, best consult the convenience of the committee if he confined himself to the preamble at present, and leave the other questions until they came to deal with clauses.

The CHAIRMAN asked whether it was proposed to call witnesses upon the clauses?

Mr. CLARK said he did not. The only evidence he required to call was upon the question of the enlargement of the works; the rest was matter of argument upon the evidence which their lordships already had before them.

Dr. *E. F. Astley*, examined by Mr. CLARK.

I am a doctor of medicine, residing at No. 29, Marine Parade, Dover, which is about 100 or 150 yards from the gas-works. The property on the Marine Parade is one of the best in the town. I have resided many years there. Four or five years ago, we experienced a great nuisance from the discharge by the company of the ammoniacal liquor from their works into the sea, and since then the smell from the works themselves has been very offensive. It is principally so in still, warm weather, which is the time of year when Dover is mostly visited. The complaints are very general on the Marine Parade, and I have spoken to Mr. Jones more than once about it. At first, he took little or no notice of the complaints; but, on the last occasion, he said there must be something wrong at the works. These smells come on now and then, and so suddenly, that they go through the house before you can possibly shut the windows. I am a member of the corporation, and I know that a petition, numerously signed, was presented to them, two or three years ago, on this subject; but the corporation could not interfere. If the works, in their present situation, were extended, I believe they would very seriously affect the property on the Marine Parade. When I first resided there, which was twenty years ago, there was no nuisance; but then the quantity of gas manufactured was very small indeed. Since 1850, the nuisance has been more serious than before. I should say, also, that complaints have been made to the corporation of the way in which the carbonate of lime is taken through the streets. It was so offensive, that an order has been given that it should be removed in closed carts, and threats have been made to fine the carriers.

Cross-examined by Mr. RICHARDS: It may be right in theory for Mr. Barlow and Dr. Odling to say there is no smell from the carbonate of lime, but it is not so in practice. It is of a greenish yellow colour, and I should say contains a large quantity of sulphur and sulphuretted hydrogen. I am speaking of the last six months. The nuisance of the works is much worse since 1850. During the earlier period of the company's operations, the discharge of ammoniacal liquor into the sea was not a nuisance; but afterwards it was poured upon the beach, and then it was a great nuisance. About four or five years ago, the board were obliged to interfere. I am a member of the sub-committee appointed a short time ago to confer with the company about this bill. There were some pipes of the company impounded, but not by the corporation. I had no hand in it. The contention at that time was nominally about the pipes, but, in reality, it was an attempt to get rid of a large gasholder erected by the company in a dense neighbourhood, and which is still complained of. The Marine Parade was built after the gas-works, but at the time it was built they were no nuisance. When I purchased my house, I gave nearly £2000 for it, and a short time ago, a house only two doors from mine, which is much larger, sold for only £1400. I have never thought of moving from my house till lately. The houses on the Marine Parade let very well, but then visitors are only there for a short time during the summer and autumn months. I do not know whether it is a fact that parties return year after year to the same houses. There is a drain from the Castle which empties itself near us out into the sea by means of an iron culvert, which turns down and dips into the sea at low water. I have no reason to believe it is a nuisance. Between me and the gas-works, there is some stabling. The corporation felt that, though they might have interfered if these had been new works, they could not indict this company at the time the complaints were made. I have never looked into their Act, and do not know that it is expressly provided that nothing therein shall prevent the company being indicted for nuisance. The 750 yards of land which the company gave £1000 for was not, I believe, in the neighbourhood of their works, but where they erected their new gasholder.

Re-examined by Mr. CLARKE: I have nothing to do with the Gas Consumers' Company. The gasholder, about which the squabble took place, is quite away from the gas-works, in a densely populated district. The town drain is west of the Admiralty Pier, the other side of the harbour; so that the nuisance complained of cannot arise from that.

Mr. *John Owens*, examined by Mr. CLARK.

I am clerk of the works in the Royal Engineers' Department at Dover, and have resided at Wellington Cottage, within about thirty yards of the gas-works, for about twelve years. I have found those works very offensive during a large portion of that time, but intermittent, according to the way in which the wind blows. Sometimes, it is very sickening and offensive, compelling us to close our windows. It is most offensive in the summer, when the wind is in the south-west; then it penetrates through the crevices, and we cannot keep it out. I do not know at what part of the process it is most offensive. Three years ago, I think it was worse than it is now. There was then a new feature in the smell—an additional stench—the cause of which I am not able to explain. My garden is almost worthless as such; nothing will grow in it; the flowers get covered with smoke and smut. I reside in my house, which belongs to Government, by virtue of my office. I thing any extension of the works will increase the nuisance from which I have been suffering.

Mr. RICHARDS (referring to the remarkably robust and healthy appearance of the witness): Do you consider it is owing to the gas-works that you are reduced to your present state?

Witness: It does not affect my health. I have no personal feeling with reference to the people at the gas-works. I have never made any serious matter of it, so far as to think about moving; but I took part in an agitation got up in the neighbourhood to have the nuisance abated. I am not aware that the company offered to buy the house in which I reside; but, if I had not that house to live in, I should be entitled to more salary.

Mr. *William Usherwood*, a lodging-house keeper, residing at No. 40, Marine Parade, gave similar testimony as to the nuisance arising from the works. In cross-examination, however, he admitted that his house, which is within fifty yards of the company's premises, was always well let, and that one family, who took apartments on a quarterly tenancy, had been residing in it for six years.

Mr. *Rowland Rees*, examined by Mr. CLARK.

I am surveyor and architect to the Corporation of Dover. It is within my knowledge that complaints have been made of offensive effluvia and nuisance from the gas-works, and I have frequently myself perceived it. Persons have come to me, in my official capacity, to make complaints; I have also heard them in the course of general conversation. The nuisance has very much increased of late years, and, if the works are extended, there is no question that property will be very much deteriorated in that part of the town. I am aware that the value of property has diminished there, as I purchased a house in the vicinity, twelve years ago, for £1800, and, a short time since, a considerably larger one, which would cost from £150 to £200 more to build, sold for £1400. In other parts of the town, there is not that depreciation of property; indeed, Dover is rising in material progress by its increased railway facilities. In reference to the impounding of the company's pipes, which has been referred to, it was my duty to take that course. Mr. Jones insisted upon putting them in, contrary to my orders, and it was simply a question of stopping him *vi et armis*. I think there are other places at Dover well suited for gas-works. At present, the company's operations are carried on in a dense part of the town. At Buckland, where it was proposed to erect gas-works, the ground is 20 feet higher than the site of these works. That would not interfere with any property.

Cross-examined by Mr. RICHARDS: Houses, like port wine, improve by time. The local taxes at Dover have undoubtedly increased of late years. The Local Board of Health is one of the blessings for which the ratepayers are taxed, and a very great blessing it is—an unmitigated blessing. They are taxed for water, of which they have an unlimited supply, and drainage. The local board have spent large sums, amounting to upwards of £60,000, for drainage and water. They borrowed that sum for thirty years, and they pay 4 and 4½ per cent. for it, and, for a portion, 6 per cent. The ratepayers, are, therefore, taxed additionally about £3000 a year for these works, which the inhabitants are very much pleased with. I have water from the corporation; but one of my houses is supplied by the gas company.

Re-examined by Mr. CLARK: Whatever may be the difference in the present amount of taxation, as compared with former years, I find that there is a deterioration in the value of property in the vicinity of the gas-works, as compared with other parts of Dover. The result of my observations is, that the houses there require painting more frequently, both inside and out.

Samuel Hughes, Esq., examined by Mr. CLARK.

I am a civil engineer, and have had large experience with regard to gas-works. I am also a consulting engineer, and have been engaged in arrangements between gas companies and corporations. The clauses which have been referred to have been under my consideration, and I am aware that they contain regulations in regard to the purity and illuminating power of the gas. In my opinion, the clauses which the company have inserted in the bill are not sufficient for the protection of the public in reference to purity. The testing clauses, as they now stand, require that the company shall erect at their works an experimental meter, and that the local board shall, on giving a certain number of hours' notice, be at liberty to send some person to the works to test the gas. I think a test of that sort is perfectly useless, as far as the public are concerned. What they require is, that the gas should be tested at any part of the town, independent of the company, and clauses which do not provide for this are practically useless, as it is most essential to know that the gas tested comes from the same main from which the public are supplied. The six hours' notice would enable the company to raise the quality of their gas by using cannel coal; and, as it is provided that the testing should not take place except in the presence of an officer of the company, it might never take place at all, as he might not find it convenient to be there. The testing clauses which I have proposed would work exactly in the same way as the clauses in the Great Central Company's Act, which was passed in 1851, under which the Corporation of London appoint an officer to test the company's gas regularly. Many small towns have thought it an advantage to throw the expense of erecting the experimental apparatus upon the gas company.

They save the £20, no doubt, but they never get their gas tested at all. The testing should be entirely independent of the company. In London, the gas is tested, not at the works, but quite away, and independently of them. I think the 46th clause in this bill, which provides that the gas shall be of a certain quality, unless the company are "prevented by frost, unusual deficiency of coals, or other unavoidable cause, or accident, or during necessary repairs occasioned by such accident," would enable the company to escape from penalty, however bad the gas was. This is a clause of recent introduction; it has crept in of late years; I do not find it in the original Acts. By the clause which I propose, it is provided that the gas "shall be free from ammonia, bisulphide of carbon, sulphuretted hydrogen, and other substances and gases deteriorating its purity or illuminating power." By the present system of manufacture, it can be made free from these, except the merest trace. I have tested gas which is entirely free from ammonia. I also propose that there should be a certain pressure provided on the mains. If the gas is to be used for cooking purposes, the pressure ought to be kept up day and night. I believe that an inch pressure would be sufficient. During the early hours of lighting in London, I know that, practically, the pressure is 30-10ths. This keeps on until about 10 o'clock at night; from then, until 12, they begin to reduce it; and, in the early hours of the morning, it comes down gradually to 6-10ths. That reduction affects the public lighting, but that is not now the question. I do not think it is at all excessive to insist upon an inch pressure. I believe that less than that is not sufficient for all the purposes to which gas may be applied. I know the town of Dover generally; and, from having heard the price at which coals can be brought there, and the returns which are realized for products, I think 5s. is an ample maximum to allow the company for gas. From the statements which have been made, I find that the average present price they charge is 4s. 3d. per 1000; taking the consumption of the public lamps as one-sixth of the quantity sold. To allow them 5s., therefore, is an ample margin; indeed, I think it would be much safer to the public to fix it at 4s. 6d. The meter-rents, which it is proposed to charge, are high. I am not prepared to say that higher rents are not charged at some places; but these are higher than the charge in London at the present time.

By the CHAIRMAN: The maximum of some companies for gas is as low as 4s. 6d. The Great Central Company are fixed at 4s. It is very difficult to say what is the average of the London companies. Many of them have no maximum at all. The highest that is fixed is 6s.; and the lowest, 4s.

By Mr. CLARK: The Great Central supply meters to their consumers without any charge for rent. I think, at Dover, the price for a 2-light meter, which they proposed to charge 5s. for, should be 3s.; for a 10-light meter, which they put at 9s., the price which I pay in London is 6s. The other charges are in the same proportion, and I think they are 50 per cent. too high. They ought to be reduced fully one-third.

Cross-examined by Mr. RICHARDS: I do not mean to say that the company should not have a profit on the money they invest in meters; but I think a rent of 10 per cent. ought to be considered sufficient. My calculation would give them something like 12 per cent. I know meters will last for 6, 8, and 10 years, in ordinary use. I am not a chemist, but a civil engineer; still I know how to analyze gas. I have been engaged in the present agitation on the gas question in London with Mr. Beal. We are not exactly the authors of the clauses which it is proposed to introduce into this bill. I own to a little of the parentage. They were introduced into a bill which was withdrawn from Parliament last year, because the promoters could not give an assurance that it would pass during the session. It was perfectly understood that we could not; we brought the bill in to ventilate the subject, and let the gas companies know what we were about to do. We have brought in a bill this session which is materially the same. I have not been to Dover lately; and my present calculations are based upon what I have now heard. I am not constructing any gas-works at present. I have never constructed any gas-works; I have been a great deal engaged on railway works in former years. I have not managed any gas-works. I am otherwise engaged; it would not answer my purpose to go and live on the spot, and construct gas-works. My experience in reference to the subject is derived from the examination of a great many gas-works, but I have never constructed any. I do not hold the appointment of consulting engineer directly, but I have been consulted by many gas companies. I know that Mr. Barlow and Mr. Hawksley call themselves "consulting engineers"; I prefer not to do so; it is a mere term. I have read this bill. There is nothing in it which would prevent the local board testing the company's gas at any place they liked, but there is no penalty, unless the gas is found deficient at the works. I am not in favour of gas companies erecting testing apparatus for the public testing of their gas; it should be done by the local authorities. In London, they are gradually finding out the necessity of it. I have erected several in London, and I believe that more and more will be erected. I do not know a single instance in which a clause for regulating pressure has been introduced into any Gas Act ever passed. It is a new clause, but I find many Acts which contain a stipulation, that the pipes should be always fully filled with gas, which amounts to pressure. If they are not full of gas, they will be partially filled with air. The clause which requires the pipes to be always full of gas, is in several of the London companies' Acts. It is not in the Imperial Company's Act, nor the City of London, which was passed last year. It was before that; I believe it was before 1839. The pressure clause is not one of my own introduction; it was suggested by one of the largest consumers of gas in London, and who uses it for cooking purposes. I have read the Gas-Works Clauses Act. I know that it was passed by Parliament after great deliberation, but I never understood that it was intended for the protection of the public. It was intended to collect in one, the clauses which had been inserted in separate Acts. There is no pressure clause in it. It limits the profits which companies may divide to 10 per cent., and provides that when the dividends exceed that, the price of gas shall be reduced. But I find in many recent Acts, that the profits are limited to much less than 10 per cent., in order to prevent the Gas-Works Clauses Act applying to them. The Great Central Company, whose maximum price is fixed at 4s., is a company supplying the City of London. The return of profit upon capital is not necessarily greater when the neighbourhood supplied is a dense one. It depends upon the price charged. I cannot tell whether a main running through London, and supplying houses and shops at every few yards, will yield a better profit than in a country town, where the lights are scattered, unless you tell me the capital in the two concerns. I cannot answer the question when I am only told to assume that the capital is just what is necessary. I do not know what the maximum of the Surrey Consumers' Company is. I know that their present charge is 4s. 6d. per 1000. It is possible their maximum may be 6s. The maximum of the City Gas Company is 5s., but you will observe there are three companies competing there, so that it is no matter what maximum is fixed; the price must be 4s. When the Imperial Company's maximum was fixed at 6s., there was great competition throughout their district. I think a fair and reasonable profit for a company to make upon the original capital risked is 10 per cent., but not after the works are established. With reference to a low maximum price, I think the tendency of gas-making is so much towards cheapening production, that the companies are perfectly safe without any margin at all. I form this opinion from inquiries I have made into the circumstances of gas companies all over the kingdom. I have visited many works for the purpose, but not with reference to the Metropolitan Gas Supply Bill alone. I think I can give this opinion confidently, though I have never constructed or been engaged in the management of gas-works.

Re-examined by Mr. CLARK: The management of gas-works would interfere with my acquisition of knowledge on the subject, because I should be tied down to a particular spot, and not be able to obtain an extensive acquaintance with their operations. I have written and published a work on the subject, and have visited nearly every gas-works in the country which are in the hands of corporations. I have been very largely engaged in arranging terms between corporations and other public bodies, for the supply of gas. In arrangements with gas companies, I have been principally engaged on the side of public bodies. The pressure clause is a new one, the necessity for which arises from the fact that gas is becoming more and more used in the daytime for cooking and manufacturing purposes. In Scotland, the invariable practice is, never to turn the gas off day or night; they would be miserable without it. Unless there is a sufficient pressure upon the pipes, no gas will pass through to burn. I think it is most essential that this pressure clause should be introduced for the sake of the consumers and also for the interest of the company. If they could only see it in that light, there would be a large consumption of gas. The Surrey Consumers' and the other companies on that side of London, have their gas tested under a special arrangement, by a chemist, and Dr. Letheby tests the gas of the Central Company in the City. These examinations are not conducted at the works of the companies. In many parishes, such as St. George's, Hanover Square, and St. Margaret's, Westminster, the local authorities have the gas tested at places of their own. I think a maximum of 5s in Dover would leave a very liberal margin for the company, on a calculation that the average price now is 4s. 3d. Indeed, I do not think any margin is necessary. The Gas Clauses Act not only does not contain a pressure clause, but makes no provision for the purity or illuminating power of gas. These are matters which are always specially dealt with in the separate Acts of companies. The Gas Clauses Act refers to the laying down of pipes and the protection of them from injury when laid down.

Mr. RICHARDS briefly replied upon the evidence for the petitioners, and complained that no intimation had been given of the line of objection which they had intended to take, so that the company might have been prepared, as they would have been, to rebut the evidence as to nuisance arising from the works, which had been given by their witnesses. The statements which had been made as to the depreciation of property in the town, were not well supported, and it was not at all shown that, if that depreciation existed, it had been caused by the gas-works. He submitted, therefore, that the committee would require some better proof of the correctness of the allegation before they required the company to be at the enormous cost of removing their works.

The room was then cleared, and the committee consulted for a few minutes. On the public being readmitted,

The CHAIRMAN said: The committee approve of the preamble conditionally, on being satisfied with the clauses.

Clauses 1 to 8 were agreed to. On clause 9, which referred to the powers of the company to "continue, maintain, alter, improve, extend, or discontinue and remove the now existing gas-works," &c.,

Mr. CLARK proposed to add the words, "provided always, that no alteration, improvement, extension, or removal of the present or future gas-works shall be made, without the consent of the local board under their common seal."

Mr. RICHARDS objected, as the proviso went directly to jeopardize the very existence of the company.

The committee consulted for a few seconds, and the CHAIRMAN said: The committee are unanimously of opinion that that clause cannot be admitted.

Clause 11, giving power to the company to contract with the local board for a supply of water to them, was struck out, and the clauses up to 43 were agreed to.

On clause 44, which provides that the company may, with the consent of the owner or occupier of any building, place pipes or necessary apparatus for supplying or measuring gas, "through or against the building," Mr. CLARK objected that it might lead to an obstruction of the public ways, and he therefore proposed to add the words, "provided no such pipe, branch, or apparatus shall be erected or fixed to a house or building, so as in any way to project beyond the line of frontage, without the previous consent of the local board, in writing, under their common seal."

Mr. RICHARDS said the proviso would prevent the company placing a lamp over the door of a tradesman, if the state of party feeling in the town should influence those in authority.

After some conversation on the point, the committee decided to strike out the clause altogether.

Clause 45, requiring the company to supply gas within thirty feet of their main, led to a long discussion, Mr. Clark requiring that the distance should be altered to sixty feet; but, ultimately, he withdrew his objection, and the clause, as originally proposed, was adopted.

On clause 46, which referred to the quality of gas to be supplied,

Mr. CLARK said he had a series of clauses to propose on this subject, founded upon the suggestions of Mr. Hughes. The first was, that "all the gas supplied by the company shall be of sufficient illuminating power to produce from an argand burner, having 15 holes, and a 7-inch chimney, and consuming 5 cubic feet of gas per hour, a light equal in intensity to the light produced by 12 sperm candles, of 6 in the pound, each burning 120 grains per hour; and shall be free from ammonia, bisulphide of carbon, sulphuretted hydrogen, and other substances and gases deteriorating its purity or illuminating power; and, if the gas supplied by the company shall be, at any time, of less illuminating power, or of less purity, the company shall, for every such offence, forfeit any sum not exceeding £100." This clause compelled them to have their gas of a certain quality, and had no such provision as the company proposed to introduce, "unless prevented by frost, unusual deficiency of coals, or other unavoidable cause or accident," which provision would lead to endless excuses, whenever they did not choose to furnish gas of the required purity. He understood that, in the Imperial Act of 1854, and the City Gas Act of last year, the same penalty was introduced.

The CHAIRMAN: In the same terms as you propose, or what was the penalty enforced for?

Mr. CLARK: Only with regard to illuminating power, I believe. But there is no difficulty, now, in having the gas pure.

Mr. RICHARDS opposed the clause, and read from the Imperial Gas Act the provisions on the subject of illuminating power.

The CHAIRMAN said there did not appear in that Act to be any allowance made for "frost or unusual deficiency of coal."

Mr. RICHARDS said the clause proposed by the other side would inflict a penalty of £100 for the presence of one thing, without which gas was never known to exist—the sulphide of carbon. Mr. Hughes told the committee that gas might be entirely freed from ammonia, but he (Mr. Richards) did not believe it; and if the least trace of it was found in the gas of this company, they would be liable to this heavy penalty. The Imperial Gas Act spoke of purity; but then it was such as chemists understood. This clause was prepared by a man who evidently understood nothing about the subject.

The CHAIRMAN said the Imperial Company could be fined £100, although they might be "prevented by frost."

Mr. RICHARDS said that was a *casus omissus* in their Act, which was provided against in the City Act. The committee would bear in mind that the Dover Company had to deal with persons who were sometimes actuated by very hostile feelings, and the amount of penalty which they would have power to inflict was a very heavy one. The Imperial Company were only liable to be fined £100, although they, perhaps, sent out as much gas in a week as the Dover Company in a year.

The CHAIRMAN said he did not see why any unusual deficiency of coals should be an excuse; it would be the duty of the company to have a sufficiency.

Mr. RICHARDS said it might arise from a sudden and unexpected strike of the pitmen, or by a declaration of war.

The CHAIRMAN thought that "unavoidable cause" would quite meet that contingency.

Mr. RICHARDS said it might be urged hereafter that a strike was not an unavoidable cause—that it was within human control, because, if the masters gave way, the men would go to work again.

Mr. CLARK said it was unnecessary to insert the word "frost" in the clause, because Dover was supplied with sea-borne coal. With regard to the question of purity, he found that the Coventry Gas Act, 1856, provided for the testing of the company's gas; and, if it should be found, to the satisfaction of the justices, that the illuminating power was not such as was required by the Act, or that the gas contained a sufficient quantity of sulphuretted hydrogen to discolour the usual test-papers, the company were to forfeit £100. A similar provision, with a £10 penalty, was in the Sheffield Gas Act. In the case of Dover, there were were peculiar reasons, arising out of the situation of the company's works, why the gas should be pure; and therefore this provision should be inserted.

Mr. RICHARDS said his friend had mistaken the effect of frost in reference to this question. It was not that it prevented the company getting their vessels up, but that the frost diminished the illuminating power of the gas. He proposed to call and examine Mr. Hawksley upon the point.

The CHAIRMAN thought that would be objectionable, as it was understood by the committee that there should be nothing but argument upon the clauses.

Mr. CLARK proposed to modify his clause by introducing the words, "unless prevented by unavoidable causes or accidents, or the necessary repairs occasioned by such accident," and reducing the penalty to £10.

Mr. RICHARDS said the company had no objection, if the words, "practically free," or, "as far as possible free," were added; but they objected to bind themselves to do that which it was known to chemists was impossible.

The committee consulted for a few minutes, after which,

The CHAIRMAN said: The committee have decided, by a majority, that we take this clause as it is, striking out, "unusual deficiency of coal," and adding, at the end, very nearly the same words as proposed by Mr. Clark, but substituting, "as far as possible."

Mr. RICHARDS said, he was told that the words, "other compounds," were so vague, that it was impossible to be bound by such a clause.

The CHAIRMAN: Do you mean even when followed by the words, "deteriorating its purity?"

Mr. RICHARDS said, he was told by Dr. Odling, that the thing was impossible, on account of the variable peculiarities of coal.

The Earl of AIRLIE: But the word "deteriorating" will rule over all.

Mr. RICHARDS: Even that would be an element of difference among chemists. What some would consider as deteriorating, others would not. In reference to carbonic acid, some chemists thought it useful, and even essential to gas, while others maintained that its absence was the test of purity; and so, also, with regard to ammonia.

Mr. CLARK said he did not want to be hard upon the company, and, as it was difficult, with some sorts of coal, to maintain uniformity, he would be content to accept the words, "as far as possible." His learned friend had told the committee that the words, "deteriorating its quality," would be a subject of difference among chemists. It was not, however, a question of chemistry, but of legal construction; and, if the company used good average coal and ordinary care, no difficulty need arise.

After some further conversation, the committee intimated that the clause must stand as amended by them, "Unless prevented by frost or other unavoidable cause or accident, or during necessary repairs, occasioned by such accident, all the gas supplied by the company shall be of such quality as to produce, from an argand burner having 15 holes and a 7-inch chimney, and consuming five cubic feet of gas per hour, a light equal in intensity to twelve times the light produced by a sperm candle of six in the pound, burning 120 grains per hour; and shall, as far as possible, be free from sulphuretted hydrogen and other compounds, deteriorating its purity."

Clause 48, requiring the company to erect a test-meter, was agreed to.

On clause 49, giving power to the local board to test the quality of the gas,

Mr. CLARK said he was instructed to propose the following clauses in lieu of this one:—"The local board may, if and when they think fit, provide all proper and sufficient apparatus, machinery, and instruments for testing the pressure, illuminating power, and purity of the gas supplied by the company, and from time to time shall appoint, and out of the district fund account shall pay, a chemical examiner, or gas engineer, or other competent person, to be an examiner for the purposes of this Act; and the examiner, engineer, or other person, or any officer of the local board, may place, and from time to time repair, remove, and renew any pipes, pressure-gauges, indicators, pressure-registers, or other apparatus, to any gas main or pipe passing through any street in the borough, in order to ascertain the pressure of the gas supplied by the company." The next clause directed the person so appointed to report from time to time to the board the results of his experiments; then followed a clause with reference to the complaints made to justices as to the supply of gas, and giving them power to appoint a person to examine into the matters alleged in the complaint; and, after this, a clause to the effect that the person so appointed "shall immediately on his appointment, have power to, and shall forthwith inspect and examine the gas-works of the company, and shall inquire into and concerning the matters alleged in the complaint, and shall make a report thereon to the justices by whom he was appointed, or to any other two justices." To this was added a clause, providing for the hearing of the complaint, and another one compelling the company within the time limited by the justices to remove the grounds of complaint. It was evident, from what was stated by Mr. Hughes, as to the extent to which gas was now used, not merely for lighting, but for cooking and heating purposes, that some provision should be made for an adequate pressure upon the pipes of the company. He therefore proposed the following clause:—"A pressure of not less than 10-10ths, or one inch head of water, shall be maintained at all times on the service-pipes of the company, within the premises of the consumer."

Mr. BURKE reminded the committee that no evidence had been laid before them as to what would be a proper pressure; but they were asked, by the last clause read, to enact that a permanent pressure of 10-10ths, or one inch, upon the service-pipes, should be maintained. He would say, in the first place, that he did not believe there was a single instance in which such a provision had been inserted in an Act of Parliament, notwithstanding that, during last session, numerous Acts were passed, after strenuous opposition by local authorities. This was strong *primâ facie* evidence against the propriety of such a clause, or as to its necessity for the protection of the consumers of gas. If it was necessary in Dover, it was necessary elsewhere; and if it was shown that it had never been granted, there must be some good reason why it had been resisted, or had never been sought. In the clause now proposed, there was no limit during which this pressure should exist; it was to be a permanent pressure, by day as well as by night, although, as their lordships knew, the consumption varied at different periods of the day. If, when there was little or no consumption, the pressure was to be maintained at 10-10ths, there must be an enormous leakage wherever there was any vent; and, moreover, it would be impossible to preserve an uniform pressure throughout the town.

The CHAIRMAN: The committee reject that clause.

Mr. CLARK proposed the next clauses which he had referred to.

The CHAIRMAN thought they were objectionable, as it was proposed that the local board should bring the company as delinquents before their own body.

Mr. CLARK: No; before the justices.

Lord TEMPLEMORE: Who may be members of the local board.

The CHAIRMAN: I think we are agreed against them.

On the clause as proposed by the promoters, in reference to the power of the local board to test the quality of the gas, being read,

Mr. CLARK required that the words "in the presence of some manager, or other officer of the company," should be struck out, and also that six hours' notice should not be necessary.

The CHAIRMAN: You do not propose that any person belonging to the corporation should go and examine the gas of the company without any officer of theirs being present? Six hours' notice may be too long a notice; it may enable them to change the quality of the gas, though I do not think it probable.

Mr. HOPE SCOTT said, the promoters would be quite willing to reduce the notice to four hours, but it was utterly unreasonable that it should be without any notice. The supposition on the part of his learned friend was, that in order to defeat the corporation, the Company would take advantage of the six hours' notice, to let off the whole of the gas in their gasholders, which was absurd. At any private house throughout the town, the local board could at any moment test the gas, but this was an application to come into the company's laboratory, and in the absence of their officers make an examination.

Lord TEMPLEMORE inquired whether it was a usual clause in gas bills.

Mr. HOPE SCOTT said it had been of late years, but always with notice.

The CHAIRMAN said he thought three hours' notice was quite sufficient.

The clause so altered was agreed to.

On clause 50, which fixed the maximum prices to be charged for gas at 5s. 6d.,

Mr. CLARK proposed that it should be fixed at 5s. The evidence laid before the committee was to the effect that, at the present time, the company were selling gas at 4s. 8½d. per 1000, which, taken with the public lamps, gave an average of only 4s. 3d.; and the company announced that, with the increasing demand, they should be able to make still further reductions. A 5s. maximum would, therefore, give them a sufficient margin. No doubt many cases could be cited where the maximum was higher, but in those cases competition would always prevent the maximum from being charged.

Mr. BURKE said it was obvious the company should have a margin for contingencies, and as by the bill the company were limited in the amount of their dividends, and they had always shown a disposition to make reductions in price, it was fair they should not be tied down to a price which, under some circumstances, would be wholly impracticable. The corporation of Dover came forward to propose this lower maximum, they themselves being supplied with gas at a price much below that charged to private consumers. In truth, there were no private consumers before the committee to oppose. If his learned friend would consent that the public lamps should be charged at the same rate as the private consumers, he should know what his object was. He held in his hand a list of a number of analagous cases, in which no competition existed, but where the maximum was fixed at a much higher rate than the price actually charged.

Mr. CLARK said each case must be judged on its own merits, and it was no answer to say that in other towns a high maximum had been allowed. Here the company enjoyed an undisturbed monopoly, and there would be no motive to induce them to charge below the maximum.

The Committee consulted for a few minutes.

The CHAIRMAN then said: There has been a diversity of opinion in the committee, and so we have come to a compromise amongst ourselves to limit the maximum to 5s. 3d.

Clause 51, referring to the charge for gas supplied to the public lamps, was struck out.

On clause 52, referring to the charge for meter-rents, being read,

Mr. CLARK said he had given some evidence to show that these rents were high, and he should now propose that the charges be reduced so as to give the company 10 per cent upon the cost, which would be a fair return to them for the money invested.

Mr. BURKE said it was quite evident that, whatever the company proposed, the petitioners would try for a reduction. There had been no complaint from the consumers that the charge was an exorbitant one, and the petitioners were obliged to resort to the evidence of Mr. Hughes, who was a person engaged to get up cases against gas companies. He (Mr. Burke) had been told that the proposed rates were reasonable, and that, under Lord Redesdale's Act, the cost of gas-meters would be considerably in-

creased. It was not compulsory upon consumers to use the company's meters, so that the remedy was in their own hands.

Mr. CLARK said it was compulsory upon consumers to burn by meter, and that, practically, all those meters would be supplied by the Company.

The Committee consulted.

The CHAIRMAN asked whether the objection of the petitioners would be removed, if the words "and approved by the company" were struck out of the clause.

Mr. BURKE said the words were not so essential now as they were twelve months ago, because of the passing of Lord Redesdale's Act. At the same time, as the company were the parties to supply through the meter, it was only right they should know that it registered properly.

The CHAIRMAN: The committee are unanimously of opinion to reject the amendment, seeing there has been no evidence before us, that any of the public have objected to the clause. I merely wish to ask whether it would be desirable that these words should be struck out.

Mr. BURKE said he was sorry to say, that he could not answer the question definitively, as he had had no experience of Lord Redesdale's Act. It seemed to him, however, that it would be better to retain them, as there were many jobbing meter-makers, and it would give parties the opportunity of forcing imperfect meters upon the company.

The clause as it stood was then agreed to, as was also the following one.

Some discussion ensued on clause 54, which related to the recovery of gas-rentals, and which it was contended would give the company a right to sue for debts under £20 in the superior courts. The clause was amended, by striking out the words "although the demand in respect thereof be less than £20."

The remainder of the clauses were then agreed to.

FRIDAY, MARCH 16.

TORQUAY GAS BILL.

Mr. RICHARDS appeared for the promoters, and Mr. H. T. COLE for the Local Board of Health.

Mr. RICHARDS said this was a bill for the incorporation of a company, for the purpose of lighting the town and immediate suburbs of Torquay, in Devonshire, with gas. The title of the bill was, "an Act to incorporate a company for manufacturing and supplying gas within the parishes of Tormoham, including the town of Torquay, St. Mary's Church, and Cockington, in the county of Devon, and for other purposes." The preamble was in the following terms:—"Whereas the population and house-property within the parishes of Tormoham and St. Mary's Church, in the county of Devon, have, of late years greatly increased, and are still increasing; and it is expedient for the better supplying the same, and also the parish of Cockington, in the said county, with gas, that gas-works, on an efficient scale, and in a convenient site, should be provided, and that a company should be established and incorporated for that purpose, and the powers conferred upon them: and, whereas the parties hereinafter named, with others, are willing to provide such works, and are desirous of being incorporated for the purposes aforesaid, but such purposes cannot be effected without the authority of Parliament." There was no opposition to the bill, except by the Local Board of Health, who had, unfortunately, found it essential to their own health to move somewhat in the atmosphere of litigation. They professed to represent the inhabitants of Torquay; but how far they did so would be shown before the inquiry terminated. It would be proved before the committee, that the inhabitants, who had not presented a petition against the bill, were perfectly satisfied with the way in which gas, hitherto, had been supplied to Torquay, and with the mode in which it was proposed to be supplied hereafter. The proposed capital of the new company was £25,000, in 2500 shares of £10 each. There was a provision in the bill, as to the amount of calls which might be made from time to time; and there was a power of borrowing on mortgage to the amount of £6250, with a provision that no part of that sum should be raised till two-thirds of the proposed capital had been subscribed, and one-half paid up. There would, probably, be no very substantial dispute upon the preamble; the contest would mainly turn upon the price and illuminating power of gas, which were really one and the same thing, because a more expensive article could not be supplied at the same profit, except at an enhanced price. There had certainly been some complaints of the quality of gas supplied to the lower part of the town of Torquay, chiefly owing to the situation of the present works, which it was proposed entirely to alter, when the complaint, which was confined to that part of the town, would no longer exist. Torquay had hitherto been lighted, not by a company, but by a co-partnership of gentlemen, who joined together in 1834, and subscribed capital for the purpose. The nearest site that could be obtained for the proposed new works was at Paignton, about two miles from Torquay, and the village of Cockington lying to the west, between Torquay and Paignton, it was necessary that the main should run through Cockington; and, therefore, it was desired to take powers to light Cockington, which, although not inhabited at present, would, probably, soon be built over, if Torquay continued to increase, as it had done of late years. The parish of St. Mary's Church was situated to the north of Torquay, and contained 1500 or 2000 inabitants, who had been, hitherto, supplied by the co-partnership alluded to. The increase of the population of Torquay had been very considerable. In 1831, it was 1800; in 1841, 6000; in 1851, 11,500; and, at present, it was upwards of 15,000. Their lordships were aware that it was a place very much resorted to by invalids, and increasingly so of late years. It was extremely hilly, and the people lived, generally, in detached villas, each with their acre or half-acre around it; so that, besides the usual difficulty of supplying a hilly district, and, at the same time, keeping up a good supply in the lower part of the town, the service-pipes to the villas were, some of them, four or five hundred yards in length. The greater part of the property in the parish of Tormoham belonged to Sir Lawrence Palk, and the remainder to a Mr. Carey. It was extremely valuable as building property; and, being somewhat of an ornamental character, it was very undesirable that the works should be carried on in the centre of Torquay, as they were at present. At first view, the distance of two miles would seem very considerable; but, when the rapid increase of the town was taken into consideration (as might be seen from the fact, that when the present works were constructed in 1841, they were free from houses, and were now entirely surrounded by them). It was evident that, in a few years, the proposed site would not be far distant from the town. The co-partnership by which Torquay was at present lighted, had no parliamentary power; and, the population being only, 800, three years before it was formed, it was not very remarkable that the scheme should have been carried out in a very primitive way. The shares were, he believed, held entirely amongst the immediate inhabitants and townspeople of Torquay. The capital had been paid up at different times; and, from 1834 to 1859, about £10,000 had been expended—every penny they had spent had been spent fairly and legitimately in the increase of their works, and was not an excess of their parliamentary powers, as in the case of the Dover company which had recently been decided. Instead of putting the whole dividends into their pockets, this co-partnership had, from time to time, reinstated some portion of it; and there was no reason to believe that the townspeople of Torquay had not been, on the whole, very well supplied with gas during that interval. As the town increased, however, the demand for gas also increased, and, probably, in a greater ratio than the increase of the town. The capital of the present co-partnership was, therefore, found insufficient; and, moreover, the new company wanted to obtain parliamentary powers to enable them to open ground, and to do those things which they would otherwise not be at liberty to do. The new company included nearly all the members of the old co-partnership, but it was not confined to them, as the shares might be taken up by any parties who pleased. In 1854, a company was started in opposition to the co-partnership, but it came to nothing. In 1855, the attempt was renewed, but, either from the parliamentary expenses being too great, or the prospects of remuneration too small, the promoters were again unsuccessful. In the same year, the co-partnership proposed to come to Parliament, with a view of changing their site to a place called Upton, but it was objected to. They came, however, upon that occasion, with the entire approbation of the inhabitants; and, it was somewhat singular, that they came with a petition in their favour, signed by some of the very gentlemen who now petitioned against the new company's bill, which was almost identical in its provisions. Probably, there would be something said with regard to the buying out of this old co-partnership; but it was clear that the new company could not take the powers of lighting Torquay, and entirely smother the existing co-partnership without compensation. In the bill of 1855, there was an arrangement made that the old company should be sold to their new incorporation for the sum of £7250. Since that time, about £2600 had been invested, which brought up the total to something like £9800. The price of gas, when the co-partnership commenced operations in 1834, was 14s.; it was now supplied at 6s. private, and 5s. 5d. public. The price asked in the bill was 6s. per 1000 cubic feet as the maximum; and their lordships would understand how necessary it was for gas companies to have a margin upon which they could rely in cases of contingency. In the Dover case, their lordships had granted 5s. 3d., the average price charged by the company being 4s. 8½d., thinking it not unreasonable that the company should take that margin of about 6d. In the present case, it would be proved that the management of the co-partnership had been careful, their expenditure reasonable, and their dividend not excessive. It might therefore be supposed, that the price now charged was a fair standard of what a company ought to receive for gas at Torquay. In some respects, Torquay differed from Dover. In the first place, it was much less concentrated in its situation, and the greater the length of main required to supply a given number of customers, the greater was the amount of capital necessarily expended, which, of course, became, ultimately, an element in the price. The position of the new works certainly involved an additional expense, but it could not be avoided, as no nearer site could be obtained; whereas, in the case of Dover, the works were immediately adjoining the town. There was also a very large difference in the number of consumers. In Dover, there were 1300, and in Torquay 400. This should be an element in the calculation; because, the smaller the number to be supplied from a main, the smaller the return and the smaller the profit. The illuminating power proposed in the bill was 10 sperm candles. It was commonly treated as equal to 12 wax candles. It was very important that the illuminating power should not be put too high, because it was very difficult accurately to arrive at illuminating power, and as penalties were almost always imposed if there was any deficiency. A fair margin should be left to the gas companies, because, in order to be safe, they were obliged to give one or two candles above the number mentioned in the Act of Parliament. Besides, an increase in the illuminating power would involve the burning of a superior quality of coal, such as cannel coal, at from 22s. to 26s. per ton, which of course increased the price of gas. The price proposed to be charged was, no donbt, founded on the price charged by the co-partnership, whose money had been carefully invested, and whose dividend had not been excessive From 1834 to the present time, they had averaged about 8 per cent., and, inasmuch as the Gas Clauses Act recognized 10 per cent., this might be taken as a moderate remuneration. The only petition presented against the proposed incorporation was from the Local Board of Health. That board professed to represent the inhabitants of Torquay, and they certainly went through the form of convening a general meeting to consider what steps should be taken to oppose this company, and a resolution was passed, authorizing the board to watch the bill with a view to the introduction of certain clauses, especially with reference to the price of gas. The population of Torquay consisted of 15,000 persons, and this meeting was composed of 150, or one hundredth part of it, and only 34 persons voted. The Board of Health could hardly, therefore, be said to represent the inhabitants of Torquay; and it would be shown to the committee that the feeling of the population was not that of dissatisfaction at the quality or price of the gas hitherto supplied. The Board of Health, however, in coming before the committee, enjoyed the advantage of paying their expenses out of other people's pockets; and that sometimes made persons not duly consider they ought or ought not to come. But he (Mr. Richards) could not help thinking that any matters of disagreement between the proposed company and the board, might have been settled without involving such serious expense; and he believed some such course was hinted at the public meeting. The members of the Local Board, who took part in the present opposition, were but nine. Some members of the old gas co-partnership were members of the board: and, under a feeling of what he should call misplaced delicacy, thought it better not to interfere in the matter at all. The petition was signed by five, and three of these signed a petition in 1855 in favour of the present co-partnership, who then sought to come before Parliament, although the bill of 1855 suggested a 6s. maximum, and contained a clause for purchasing the old company. Now, if they did not object to 6s. in 1855, it was difficult to see what had occurred to make them object to it now. On the other hand, he (Mr. Richards) would prove that 282 of the 384 consumers, had signed a declaration on behalf of the company, and would show, by the officers of the company, who came into direct contact with the customers, that their feeling was decidedly in its favour, and that they had not been hitherto dissatisfied with the charges.

Lawrance Palk, Esq., M.P., examined by Mr. RICHARDS.

I am an inhabitant of Torquay, and my father, Sir L. Palk, owns three-fourths of the property in the neighbourhood. I attended in Parliament upon a former bill, which was promoted with this object in view. As an inhabitant of Torquay, I am in favour of this bill, and think it might have been settled in Torquay, without coming here. The present price of gas at Torquay is 6s. per 1000, which I do not consider extravagant, considering the nature of the town, which is very hilly. There is no strong feeling, that I am aware of, against this price. As far as I know, the management of the

co-partnership has been fair and reasonable. The site of the present gas-works is now surrounded by houses. It was selected in 1851. My father is in favour of the incorporation, and would sell the company land, if he had any in the parish which was fitted for the works. Taking all the circumstances into consideration, the site at Paignton is a very good one. It is on a level with the lowest parts of Torquay. The present works are not; and I have heard complaints from persons who live in the lowest parts of the town, of the deficiency of the supply. Torquay has rapidly increased of late. It has increased from 40 or 50 in 1800, up to 12,000 Under the circumstances, I believe 6s. per 1000 to be a fair price for the company to charge. The houses in the vicinity are mostly detached, or semi-detached. The services from the main pipe are very long, and there is, consequently, considerable waste.

Cross-examined by Mr. COLE: I include this item, and the difficulty of getting coal, and other circumstances, in considering the price. In 1833, the population of Torquay was, probably, not more than 3000. We have 200 public lights. I believe we pay 5s. 6d. per 1000, and the Local Board does all the lighting, extinguishing, and repairing, at their own expense. I think it would be a good thing to remove the works from their present site. I do not think it necessary that the company should be compelled to remove their works from their present site, as they must do so for their own convenience. At present, they have to force the gas down hill to supply the lowest parts of the town—a very expensive process. In the new site, the company will be able to draw their coal on a level road.

Mr. RICHARDS said that, should the preamble of the bill be passed, he would be prepared with a clause to prohibit the maintenance of the old works. He was willing to put any clause in the bill to show that the old co-partnership were the promoters of this bill, and to prevent the two works being carried on. Should this offer be met, and the opposition be withdrawn, he would fix the sum of £9500 to be paid for the old company, and would limit the maximum price to 5s. 6d. per 1000. He made this offer without prejudice. He thought there could be no objection to considering the preamble as proved.

Mr. COLE stipulated for the maximum price to be 5s. 3d., as at Dover.

The CHAIRMAN said, as far as he understood the learned counsel on both sides, they were agreed as to the price to be paid for the old company. They had better, therefore, proceed upon the assumption that the only question to be decided was that of price.

Mr. COLE said he was only anxious to protect the interests of the public in the matter. He wished the co-partnership to declare their capital, and to limit the price of gas, according to the increasing demand for it, which was very great.

The CHAIRMAN (to Mr. Richards): Do you say anything about the capital?

Mr. RICHARDS said the new company asked for a capital of £25,000, with a borrowing power to the extent of a fourth of that sum. They offered to guarantee that no part of such sum should be raised until two-thirds of the capital was subscribed, and half paid up; and they considered that they were entitled, under these circumstances, to what the Gas Clauses Act expressly stated as a fair and legitimate profit—viz., 10 per cent. The Act provided that, after paying this dividend, and leaving a margin of profit, the price of gas should be reduced to the consumer. He could conceive of nothing fairer than that the old co-partnership should receive the amount of their capital, and retire. Surely, they were not to give up their trade and goodwill, without being remunerated for it.

The CHAIRMAN: You had better go on with your witnesses, and confine your examination to the subjects under dispute.

Mr. RICHARDS: Then we may consider the preamble as proved.

Mr. *Dymond*, examined by Mr. RICHARDS.

I am concerned for the estates of Mr. Carey, the owner of a large portion of the town and neighbourhood of Torquay. There is a great deal of building upon his property. I have been connected with the property, more or less, for the last ten years. I am acquainted with the locality of Torquay, and know Paignton. Taking all the circumstances of Torquay into account, I consider that Paignton is the most eligible site. The price charged to the private consumer has been 6s., which, I should think, is a reasonable price, under the circumstances of the case. I live at Exeter, but am in Torquay every week, and have never heard any complaints from Mr. Carey's tenants as to the price of the gas. I remember the gas bill of 1854. The maximum price in that bill was 6s. I never heard any objections raised to that price.

Cross-examined by Mr. COLE: I was not aware that 6s. was a reduction upon the price the inhabitants were paying previously. The town is now extending towards Paignton, as well as in other directions. It has increased largely since 1854.

Re-examined: Cockington lies between Torquay and the proposed works. I do not remember that the price was once 14s.

Mr. *James Greenfield*, examined by Mr. RICHARDS.

I am the clerk and manager of the existing co-partnership, and have occupied that position about seven years. I was formerly inspector of the Phœnix Company and at Devonport. I have had a good deal of experience in gas-works. About 40 gentlemen are connected with the co-partnership, but it is mainly managed by three. We have 348 private consumers, and 27 public bodies, such as churches, chapels, public lamps. I collect the rents of the company. The total amount for Lady-day, 1859, was £3200. That sum includes the whole receipts of the company, coke, tar, &c. We have laid rather more than 16 miles of main, which are being constantly extended. It is a very excessive proportion of mileage to the number of customers. It is about 100 to 1 more in proportion to the Phœnix Company. The hilly character of Torquay increases the difficulty of supplying the town. The present works are quite inadequate to the supply. I come constantly into contact with the consumers of the gas, and of late years I have heard but few complaints. I have consulted the greater part of the consumers respecting the opposition to this bill. Most of them signed a declaration. The declaration was produced and read. It was to the effect that the consumers expressed their satisfaction at the prospect of the speedy removal of the gas-works from the town to a more eligible and convenient station, and that, in the opinion of the declarants, 5s. 6d. ought not to be objected to as the maximum price; that they had confidence in the intention of the company to reduce the price from time to time as they were able, and that they deprecated any hostile measures which might have the tendency to defeat or delay the settlement of the question. The signatures appended to the document are those of bonâ fide consumers. 282 signed; 9 were neutral; 9 refused; and 48 were not applied to, for want of time. The quarterly gas-rental of the 282 persons who signed is £599. 8s. 5d.; of the nine who were neutral, £15. 19s. 9d.; and of the nine who refused to sign, £16. There is every prospect of the consumption of gas increasing. According to the photometic apparatus, the illuminating power of the gas we have hitherto supplied to Torquay has been about ten sperm candles; but I have not much confidence in the apparatus. I am certain that two men may arrive at different conclusions, within a candle or two, if they take that apparatus as a guide.

Cross-examined by Mr. COLE: I got the declaration from Mr. Kitson's office, and took it round to the consumers. I did not tell them that the 6s. was named as a matter of form. I told them that the company would probably reduce the price. I don't know what the original capital of the company was. I have heard that the original shares were £5; but I don't know that the shares were at a premium in 1847. The Phœnix Gas Company charged various prices when I was with them, ranging from 4s. 6d. to 6s. I don't know what price they now charge. In some portions of the district, the Phœnix has mains as small as 2-inch. The largest of our mains is 7-inch for about 700 yards. The next size is 6-inch. Of 2-inch, we have 17,000 yards; of 2½-inch, a very small quantity; of 3-inch, about 8000 yards. The 2-inch and 3 inch constitute about 6/7ths of the whole length of main. Our total length of main is 28,000 yards. The private consumers take the gas into their houses at their own cost. Our present price for coal is 18s. and 19s. Freights are now on the decline. The average price has been upwards of 17s. I believe we have paid as high as 22s., and as low as 16s. We have been getting as much as 20s. per ton for coke; that is our present price since the cold weather set in. We sell about one-third the quantity in weight that we purchase. We get a very low price for the tar. The charge for the public lamps is 5s. 5d. per 1000; the cost of lighting, &c., being defrayed by the local board.

Re-examined: Our works cannot be put into comparison with those of the Phœnix. The price of coal will be materially increased to the company when they are removed to their new works, as the cartage and wastage will be greater. The price of the coke will be lessened in proportion to the distance the people will have to carry it. Paignton is two miles from Torquay.

By Mr. COLE: It is not likely we shall get the vessels into Paignton. I have heard that the coals are 1s. a ton higher in Paignton than in Torquay. A considerable portion of the coke is sold to coal-merchants. The main to Torquay will be a 12-inch.

Mr. *Browning* examined by Mr. RICHARDS.

I was with the Chartered Gas Company 12 years, and am now manager of the Plymouth works. I am to be employed in the removal of these works to Paignton. I consider the proposed capital to be quite reasonable, and also the price proposed to be paid for the old company. The main from Torquay to Paignton will be at present an unremunerative outlay. I see no prospect of Cockington being lighted. The cost of laying the main will be about £3200. I do not think the cost of coals will ever be less than 17s. The price of coal is increasing at the pit's mouth. I put the cost of freightage at 2s. per ton. I include that in the 17s. At times, we shall have to pay a much greater price; I do not know the illuminating power of the gas at Torquay. To raise it higher than 10 sperm candles, we should have to use a certain quantity of cannel or Boghead coal, which is very expensive. Looking at all the circumstances of Torquay, I consider 6s. is a fair maximum price to charge.

Re-examined: I have paid several visits to Torquay of about a day's duration. The Plymouth company charge 3s. 9d. per 1000. That is a fair price.

By the CHAIRMAN: The maximum price at Plymouth is 6s. I am not aware that there are two coal-merchants at Paignton who get their coal from the pier; I don't believe the captains would unload there. We propose to expend £10,000 on the new works, including the cost of the mains. We have no other expenditure except buying the old works; I think it right to have borrowing powers of £6200.

Re-examined by Mr. RICHARDS: I have allowed nothing for the purchase of the site. The question of illuminating power is one merely of price. That which is proposed is a very good light. I looked at Paignton with a view to see whether it would be possible to unship coals at the pier, and my conclusion is that it would be impossible. At Plymouth, we have about 4000 customers; our main is about 46 miles, and our capital £50,000. In 1844, we were charging 5s. per 1000, and we increased the price to 6s., in consequence of the Russian war.

Mr. *John Vickary*, examined by Mr. RICHARDS.

I am a gas-engineer and contractor, and have been much engaged in the construction of gas-works. I was employed to report on the works of a company promoted in 1857. I consider 6s. a fair maximum price for the company now seeking incorporation. I heard of no opposition to 6s. in 1857. At that time, the works were to have been erected at Upton, close to the town. This company will have, in addition, to provide a new main. I confirm Mr. Browning's evidence as to the cost of the proposed works. I believe no large vessels unload at Paignton. The gas company's vessels range from 200 to 300 tons burthen. The distance from the pier to the works is nearly as great as from the works to Torquay. I am acquainted with Dover. The Dover company would have scarcely any unproductive main, and the town is a much larger gas consuming town. I consider 10 sperm candles to be a sufficient illuminating power as a minimum.

Cross-examined by Mr. COLE: An illuminating power of 12 sperm candles cannot be maintained from Newcastle coal. I cannot tell whether the railway station is more or less than a mile from the works. There are three stations, and gas is burned at each. There are some public lights outside the town between Paignton and Torquay. The bill of 1857 was promoted by a new company.

William Kitson, Esq., examined by Mr. RICHARDS.

I am a solicitor, and have resided 40 years in Torquay, and have been engaged as agent and manager for Sir Lawrence Palk. I took an active part in the formation of the gas partnership, and have since taken an active part in the management. I have received no remuneration for my services. In 1831, the population was 1800, and the price of gas was 14s. Since that time, the population has much increased, and we have been enabled to reduce the price. We have extended our works, and invested fresh capital from time to time. Up to last year, the partnership had invested about £9259 in gas plant. For three years, the dividend has been carried to capital, and expended in plant. The company thought it best not to raise additional capital until this bill was passed. Our average dividend has been about 8 per cent., excluding those profits which have been added to capital. We started with a capital of about £2000. The fresh capital added from time to time has raised that to £6056. 5s., and we have added £3213 in the shape of undivided profits. The 8 per cent. dividend has been calculated upon the subscribed capital of £6056. The dividends would average 5 per cent. upon the entire capital. I am a member of the local board, but have abstained from attending and voting at the meetings. There was a meeting of ratepayers in February last. It was attended by about 100 or 150: 34 persons only voted.

Cross-examined by Mr. COLE: In 1847, our shares were at a premium. We had occasion to raise additional capital, and the gentlemen who are

now petitioning against the bill sold out at £8 per share. We then called our shares £10, and issued new £10 shares at £7. We may be said to have paid a dividend of 8 per cent. on those £10 shares, but it would not be 16 per cent. on tho money subscribed. In 1847, the capital subscribed was about £3750, and the dividend was between £200 and £300.

Mr. COLE: What I believe to be the case was, that the dividend was paid upon the £10 shares.

Some discussion ensued as to whether the dividend was 16 per cent. on the £5 shares, but it appeared that the dividend was calculated upon the amount actually subscribed, and was in addition to the sum added to capital from income.

This was the case for the promoters of the bill.

Mr. COLE addressed the committee on behalf of the Board of Health. He apprehended that everybody who looked at the bill would have thought that it was promoted by an independent body of gentlemen. There was no declaration as to the amount of the capital of the old company, nor any value given to the works of the new company, nor any provision for compelling the purchase and the discontinuance of the old works.

The CHAIRMAN said he believed an offer had been made to insert a clause in the bill, granting all that the learned counsel required upon this particular head.

Mr. COLE said he felt it necessary for him to make this statement, as the Board of Health had been attacked for unnecessarily opposing the bill. It would have been just as easy to have made the proposition which his learned friend had laid down before the case came before the committee, as to make concessions while the case was going on. What they complained of was, that there was no sufficient guarantee, that the new company would make and sell a good and cheap supply of gas. There was no clause in the bill fixing the illuminating power at which the gas should be supplied, and they were bound, as guardians of the public interest, to oppose the bill on that ground. He contended that ten sperm candles were not sufficient, and that the maximum price fixed was too high. Again, if the company were to enjoy a 10 per cent. dividend, it should be calculated upon a stated capital reasonably and properly raised. He had had very great difficulty in ascertaining what the capital of the old company was. If the co-partnership had been incorporated, they would only be entitled, as in the Dover case, to a 10 per cent. dividend upon their original capital, whilst upon any capital which they raised from revenue they would only be entitled to 5 per cent., and he believed, in the Dover case, the company were not allowed to capitalize the whole amount raised. With regard to the price, gas could be produced as cheaply at Torquay as at Dover. Upon their own evidence, he had proved that coal could be obtained for 17s. per ton, including haulage, by the gas company—the same price as was paid at Dover. At Torquay, a considerably higher rate was obtained for coke, viz., 20s. per ton; whilst the Dover company could only get 14s. The Dover company again supplied the public lights for 2s., whilst the company at Torquay proposed to charge 5s. 5d.

The CHAIRMAN said, these questions arose, strictly speaking, upon the clauses, but if the learned counsel could come to an agreement upon the clause regulating the amount of dividend to which the company were to be entitled in respect of their original capital and the accumulated dividends, it would be desirable to adjourn the preamble until that question was decided.

Some discussion arose on this point, and the preamble, (which was subsequently proved,) was amended, by stating that, whereas the town of Torquay had been supplied since the year 1833, by a co-partnership, and whereas the capital of the said co-partnership was £9500, whereof £3500 was in the shape of capitalized dividend, &c.

Clause 5, regulating the amount of dividend, was then discussed, and the room was cleared, pending the decision of the committee upon the point. On re-admission, the CHAIRMAN said: The committee have decided on allowing a maximum dividend of 10 per cent over all the capital, minus the £3,200 which were capitalized out of their dividend by the old co-partners, on which the maximum dividend shall be only 5 per cent.

The preamble, as amended, was then passed.

With reference to the price to be charged for the gas,

Mr. COLE said the Board would agree to 5s. 6d., if the company would give an illuminating power of 12 candles.

Mr. RICHARDS objected to that price as not sufficiently remunerative as a maximum price, and contended that the consumers of Torquay being only a third of the number of the Dover consumers, they must expect to be charged at a higher rate. He was reminded that the Dover company supplied the public lights at a loss; they had, unfortunately, entered into a losing contract, but it was not to be expected that a commercial concern should be carried on in that way. The price of coals, in some instances, might be the same, though in this particular case it was not so, as the price in Dover was only 14s. 6d., while in Torquay it ranged from 17s. to 19s.; but the main question was the extent and nature of the district supplied, and it was impossible to serve a small and dispersed population so cheaply as a large town like Dover. The old co-partnership had not made an unreasonable profit at 5s. 6d. or 6s., and a slight margin should be allowed to meet contingencies.

Mr. COLE could not see on what ground the company proposed to give an illuminating power of 10 instead of 12 candles, and to take a higher maximum besides. The average price of coal at Torquay appeared to be 17s., which was somewhere about the price at Dover; and, if the Dover company lost on their lights, the Torquay company, who gained upon them, should certainly be able to sell gas at the same rate. As the population of Torquay was rapidly increasing, the difference in the present number of consumers was not so material as had been represented. The co-partnership had been receiving 8 per cent. all along, and they now wanted to secure 10 per cent. He wished to compromise the matter by offering 5s. 6d., which he considered would amply compensate the company.

The room having been cleared,

The COMMITTEE, after deliberating, decided unanimously in reducing the maximum to 5s. 6d., with an illuminating power of 10 sperm candles.

Mr. COLE proposed that the board should have power to appoint an additional auditor, only one being mentioned in the bill.

Mr. RICHARDS objected, and said he would rather, if there was any difficulty, stand upon the general act.

The clause was accordingly struck out by the committee.

The following clause was introduced—"That the company shall not manufacture or sell gas, until they have acquired the works of the existing co-partnership, and that the manufacture or supply of gas at or upon such works, shall be discontinued within three years from the passing of this act."

With reference to the appointment of a tester,

Mr. COLE suggested that he should be appointed by the local board.

Mr. RICHARDS contended that inasmuch as the local board were one party to the contract, and the company contracted with them for the supply of the public lamps, they would be the first to assent that the illuminating power fell below the standard, and it was, therefore, important that the tester should not be a servant of the board. It was more fair and reasonable that the appointment should rest with one of the county justices. Another objection was that the local board must be called together, as they could only act under their common seal, and, in an urgent case, the delay might be undesirable.

The CHAIRMAN said that would be all the better for the company.

Mr. COLE said the question was, who should put somebody in motion. Generally what was everybody's business, was nobody's business; but, if the matter rested with the board, it would be at once attended to.

The COMMITTEE decided in favour of the local board, with three hours' notice on the part of the tester.

Mr. COLE proposed a clause requiring the company to supply public lamps, if within 115 yards of each other.

Mr. RICHARDS suggested 30 yards: he considered there ought to be some reasonable limit, to prevent their being required to straggle out into the suburbs where there was no remunerative custom. There would be no objection to go into a neighbourhood that was fairly occupied.

Mr. COLE said the object of the local board was only to put the lamps where necessary; and, having to pay for them, they would not be likely to incur useless expense.

The CHAIRMAN thought 115 yards out of the question, and suggested 50.

Mr. COLE reminded the noble lord that the distance in the town was at present 64.

The CHAIRMAN: You must remember that we may refuse the clause altogether which is somewhat unusual and rather stringent.

The distance of 50 yards was accordingly agreed to.

On the question of meters to public lamps,

Mr. COLE proposed that a meter should be supplied to every 12 lamps. He said the company by one of their clauses might compel any consumer to burn by meter, and might, therefore, at some future time, require a meter to each lamp.

Mr. RICHARDS: Every "consumer" might be required to burn by meter, but it was not necessary that he should have more than one meter. It would be just as reasonable to say that a man burning six lights in his shop should have six meters.

Mr. COLE said the lamps were situate in different parts of the district; and, in the case of a private consumer, different meters had to be provided for lights supplied by a different main.

Mr. RICHARDS observed that it was very unusual for public lamps to pay by measure; he thought if the proposal of his learned friend were agreed to, an arrangement to burn by light, which was certainly the best mode, would probably be prevented. At the end of two years, they would know what each lamp consumed, and they might then be disposed to contract at per lamp. He did not see the necessity for having so many meters. They might have one for the whole town, if they liked.

The clause was struck out.

Mr. COLE proposed a clause to the effect that the company should keep a map of the mains laid down which the board might have liberty to inspect.

Mr. RICHARDS said the board had their own inspector, and he did not see why the company should be compelled to keep a map which they might not require for their own purposes. There would be no objection to the board having access to any map the company possessed.

The CHAIRMAN thought the latter suggestion a very reasonable one, and it was agreed to.

It was then proposed to insert the words, "That nothing in the present act should affect or prejudice the rights of the local board," but the amendment was afterwards withdrawn, and several other clauses having received minor alteration, the bill passed the committee.

HOUSE OF COMMONS.

TUESDAY, MARCH 13.

MANCHESTER WATER BILL.

(*Before Mr.* NORTH, *Chairman, Mr.* MILDMAY, *Mr.* HUMBERSTONE, *Sir* BROOKE BRIDGES, *and Mr.* WESTERN.)

Mr. HOPE SCOTT and Mr. BURKE appeared for the Manchester Corporation, who promoted the bill; Serjeant BELLASIS and Mr. BADALLY for Lord Edward Howard; Mr. WHEELER for Messrs. WALLER; Mr. CLARK for the Corporation of Stockton, and for Messrs. Whitley and Clayton; and Mr. OUSELY for the ratepayers of Droylsden; and Sir DUNCAN MAC DOUGAL, K.C.B., supported his petition in person.

Mr. BURKE, in opening the case, said it would be his duty to contend that the bill should be considered as a non-opposed bill, as it did not, in any way, affect the interests of the petitioners. The objects of the bill were twofold—to raise money for the purpose of the water-works, and to make an alteration in the powers of rating at Manchester. The Manchester Corporation, in the year 1847, prosecuted a bill for supplying the town with water. They passed an Act in that year, whereby they were enabled to execute works. In seeking to supply a town by the absorption of a large amount of water, it was impossible not, to a great extent, to affect existing interests, and provisions were generally inserted in Acts of Parliament to this effect: that if you propose to collect the water-shed of a large district, whereby several mills are now supplied, you shall, out of your reservoirs, send down a certain quantity of water sufficient for the purposes of the mill-owners. Such a provision was made in the Act obtained by the corporation. In 1848, they came again before Parliament to amend the former Act, and a clause was inserted, by which the corporation were bound to send down the Etherow 75 cubic feet of water per second; such supply to be discharged at such rate, in such manner, and at such times as the occupiers of the several mills should determine. Experience showed that this could not be complied with; and, accordingly, in 1854, it was determined to apply to Parliament to amend their previous Act; and it was enacted that the corporation, and the several persons who, in the event of any failure to discharge the supply of water, were authorized to sue the corporation for penalties, might agree for the reduction of that prescribed quantity, to any quantity not less than 55 cubic feet per second. Certain persons had been named in the Act of 1848 as the parties entitled to sue, and recover penalties, and they were specified as those persons whose interests were considered to be affected. The corporation, and all the several parties, had since agreed for the reduction of the prescribed quantity of water to 55 feet per second. The petitioners, who were none of them mentioned in the Act of 1848, were now coming forward to object to that agreement; in fact, their object now was, to upset the legislation of 1848 and 1854, although they had never objected to those Acts at the time of their being passed. Clause 14 of the present bill provided that, out of the

moneys which the corporation were now empowered to raise, they should pay the amount of compensation which had been agreed upon between the corporation and the parties named in the Act of 1854, or so much as should be unpaid; and upon such payment the corporation should not be under the obligation to discharge down the river Etherow more than the reduced quantity of 55 cubic feet per second. One reason for the introduction of this clause was, to render it obligatory upon the corporation to pay the compensation out of the first moneys received. Those moneys, however, were now paid, and the promoters proposed to strike out that clause. In so doing, they would strike out all the objectional matter, against which the petitions were directed, from the bill, and the petitioners would have no right to be heard. If Parliament was wrong in its decision in 1854, it was competent to the parties to raise that issue, by bringing in a bill themselves. His friends might make out the most woful case of injury that could be conceived. But they were not there to determine whether what was done in 1854 was right or not; and it was not competent for the petitioners in a bill brought on for other purposes, to raise that issue before the committee.

Serjeant BELLASIS contended that the corporation had exceeded the powers granted by the Act of 1854, in concluding what was intended to be a perpetual agreement with the occupiers; and, therefore, Lord Edward Howard had a right to oppose them when they were seeking an extension of those powers.

Mr. BURKE having replied,

The CHAIRMAN said: It is the opinion of the committee, that Lord Edward Howard has a *locus standi*.

After some discussion, it was decided that the Corporation of Stockport, and the ratepayers of Droylsden, had no *locus standi* before the committee.

Joseph Heron, Esq., examined by Mr. BURKE.

I am town-clerk of Manchester, and am acquainted with the position of the corporation in reference to the water-works. None of the money now asked for is intended to be applied towards any payment connected with the Act of 1854. We have found the difficulties much greater than we anticipated, both as regards the expense of the works, and the quantity of water supplied. The total cost of the works has been £770,000, including £125,000 for pipes. Since we have commenced taking the water, we have supplied the millowners on the Etherow with a quantity of water, equal to 50 cubic feet per second, for twelve hours every day, by way of compensation—that is equal to 15,000,000 gallons per day. The quantity we supplied to the inhabitants for all purposes was, in 1852, 5,000,000 gallons daily; in 1854, 7,000,000; at present, it is not quite 11,000,000 gallons per day. The total quantity, which it was anticipated would be available, was 30,000,000 gallons per day. The total quantity supplied is about 20 gallons a head each day; that supplied for domestic purposes would not be more than 11 or 12 gallons a day, which is the lowest supply of any town I am acquainted with. We do not attempt to supply water for the use of factories generally; it would be too expensive. The supply in Glasgow is 50 gallons per head a day: in many places it is 30 gallons. Twenty gallons, considering that that includes all purposes, is very low indeed. Our power to supply the millowners, depends upon our being able to construct the reservoirs originally proposed. We have not been able to do that in a single instance. It was contemplated that they would hold 300,000,000 gallons; they do not hold anything like that quantity, so that we have been disappointed in the supply, and disappointed in the expenditure. In the meantime, our expenditure is very considerable. We have been spending from £8000 to £10,000 annually in endeavouring to perfect the reservoirs, and shall require that sum annually in future for some time to come. That is one of the purposes for which we require more money. It is possible we may have to go to a much more serious expenditure in putting up a new bank. We also require a quantity of new main pipes. The only security for the money borrowed is the borough water-rate. There is a compulsory domestic rate payable on all dwelling-houses, and a public rate payable on dwelling-houses, and every other description of property. The domestic rate is at present 8d., the public rate 2d. The sum we now ask for is £195,000.

Cross-examined by Serjeant BELLASIS: I cannot tell from whom we borrowed the money to pay the compensation to the mill occupiers. The agreement for compensation to the Vale House mill was made with Mr. Rose, the tenant, and the trustees und mortgagees of the property. The money was paid to the trustees and mortgagees. I do not know how they disposed of it. I do not know that the Vale House mill is the property of Lord Edward Howard, at the end of the present lease. The amount paid in that case was £2000 for the reduction of the 20 cubic feet per second. I cannot say whether that is an agreement *in perpetuo*. It is in the terms of the agreement clause of the Act of 1854. If that was intended to be perpetual, our agreement is perpetual. We thought it well worth while to give them that under any view of the case; but I have no doubt the agreement is perpetual. I believe it could easily be shown that our having to send 55 feet of water down the Etherow one year, and 75 feet the next, would lead to such difficulties that the Act could not be construed to mean anything of the sort.

Serjeant BELLASIS: Do you think it reasonable that occupiers alone should have the power of fixing money-compensation in perpetuity?

Witness: I should think the clause introduced into our Act of 1855 was a reasonable one, because the parties mentioned were, in nearly every instance, owners in fee, or lessees, for a long term of years. I would not undertake to say that the Vale House mill is in fee. The next agreement we made was with Mr. Cross, the occupier of the Tentwistle mill and the Bottom's Lodge mill. The corporation purchased the mills. We paid Messrs. J. and W. Sidebottom, at the Waterside mills, £12,000 as compensation. Part of their property is freehold, and part, I have been told, reverts to Lord Howard at the expiration of 999 years. The money was paid early in January. The next agreement was with Mr. John Dalton; he is occupier and owner of a mill; we paid him £5000. The next mill was Messrs. Marslands'. It belongs partly to them, and partly, in reversion, to Lord Edward Howard. We paid £3500. They had threatened an action, and £1500 was considered to be payment for damage which they might have sustained, and £2000 as purchase of their interest in 20 cubic feet of water. There is a power in the agreement to defer the payment of the money as long as we saw fit. That is the form in which we drew them all; we had to make them with the different parties from time to time, so we retained power to cancel the agreements by giving twelve months' notice, and sending down the 75 cubic feet of water; because, if one party had refused to agree, we could not have refused the quantity of water. We paid Mr. John Sidebottom, at Broad Bottom mills, £6000; I believe he is the owner in fee. In every instance, except Mr. Cross, the person to whom we paid the money has been either owner in fee or lessee. The next is the Hodge mill. We paid Mr. Malley, who is the owner, for a long period, £4500. The next agreement was with Messrs. Andrew; they were the occupiers, and we paid them £7500. That agreement was made some years ago; they are differently situated to all other millowners on the stream, and have very large storage reservoirs. Besides these agreements, we have paid money to Mr. Bostock, who is owner of a plot of land above Broad Bottom mills, and having power over their water supply We have a conditional agreement for buying that plot of land; and we agreed, in addition, to pay Mr. Bostock £1000, in consideration, for this arrangement, provided we succeeded in making arrangements with all the parties specified. The amount originally stated in the bill to be required was £95,000. Now it is £195,000. When the £95,000 was put in, a considerable portion of the compensation-money was unpaid. We did not increase our requirements in order to pay the compensation; we shall want the money in order to carry on our works. We do supply water for trade purposes, and sell it at the highest price we can get. There are several calico-printers who are very large consumers, because they require water of a soft and pure character, and can afford to pay a very high price for it.

By Mr. CLARK: By the Act of 1848, we were required to place a gauge for the purpose of measuring the water sent down the Etherow. That gauge has never been completed.

WEDNESDAY, MARCH 14.

Mr. *Heron* was recalled this morning, and his cross-examination continued.

By Sir DUNCAN MACDOUGAL: I do not know whether any compensation has been paid to millowners on the Goyt, below its junction with the Etherow. The Chadkirk print-works are on the Goyt, below the junction. I presume that the reason they were excluded from compensation was because they insisted upon being left out in the arrangement of 1848. They not only did not think it worth while to interfere, but distinctly refused to interfere, on the ground that they were not interested in anything done on the Etherow. Parliament gave to those parties alone who had taken the trouble to come forward to secure it, the power to receive compensation.

Re-examined: There is no clause in the bill, as it at present stands, that affects the rights of Sir Duncan MacDougal, or any other petitioner. There not a word in our bill, except what relates simply to borrowing money. In the year 1847, there was a scheme for husbanding the waters of the Etherow, for the purposes of the millowners; the object of the parties promoting that bill was to make all parties, who should be benefited by the water of the Etherow, contributable to the expenses. The millowners situated as Sir Duncan MacDougal objected, because they were supplied by the Goyt, and were not interested in the Etherow. The Etherow scheme and the Manchester Corporation bill came into compensation with each other. A negotiation took place between the parties, and the result was, that 60 cubic feet of water per second was agreed to be given to the promoters of the Etherow reservoirs. The scheme was enlarged by the Act of 1848, by which we secured 3000 acres additional drainage-ground, and we then agreed to give them 75 feet. The quantity we have supplied was much greater than would otherwise have been enjoyed by the millowners. The natural supply in summer was not more than from 12 to 18 feet per second. We have found it impossible to supply the 75 feet. It was competent to the parties situated on the Goyt to have objected in 1854; if they had claimed compensation, they would have divided with the other millowners the compensation to be paid. But, Parliament having specified the parties to receive compensation, we have been obliged to divide the money between them. It is now upon a bill not affecting the interests of the petitioners at all, that the previous legislation is sought to be altered.

John Frederic Bateman, Esq., examined by Mr. BURKE.

I am engineer to the Manchester Corporation. The money now asked for is required for extending the works in various ways. The works have been constructed about eleven years, and the supply has been extended to the suburban districts. For pipe-extension alone, we require £100,000. The whole engineering expenditure, up to the present time, has been £670,000. The reservoirs themselves are by no means complete. Great difficulties have been experienced in the construction of the works. The expenditure, during the last six years, upon the extension of piping, and works done from time to time upon the reservoirs, has been £10,000 or £11,000 annually. That will go on for some years longer. Looking forward to the next ten or fifteen years, it is possible that the whole of the money now asked for will be required for the extension of the works. The £100,000 includes the laying down of new mains from the Denton reservoir. The water from the Denton reservoir is conducted through a 36-inch pipe; a new 36-inch pipe is required, which will cost £40,000. There is at present great difficulty in supplying high distant points, and therefore the new main will have to be laid. There was an urgent necessity for a supply of water at the time this project was initiated, and it has been productive of an immense amount of benefit to the town. Not only is the water supplied to the district contemplated in the Act, but it has been extended to the surrounding neighbourhood, and by-and-bye will become the great source of supply to that vastly increasing population. The revenue has always met the outlay, because there is the power of levying a compulsory rate. I have examined the works from time to time. I found that the supply was becoming increasingly difficult; and, in my last report, I recommended the application to Parliament for the present sum.

Cross-examined by Serjeant BELLASIS: The pipes to be laid are supply-pipes and distribution-pipes. The other £95,000 is to make the reservoirs perfect, which I am sorry to say they are not at present. I do not consider they are in a dangerous state; they are in an unsatisfactory state. I hope less than £95,000 will put the reservoirs in a safe condition. The water supply beyond the town of Manchester is sold in bulk, sometimes to individual consumers, and sometimes to parties who distribute it at their own works.

By Mr. CLARK: We supply Bowden and Duckinfield, which are districts not naturally supplied by water from our drainage-grounds; they are districts not mentioned in the original bill of 1849. Mr. Heron made a mistake in his evidence as to the gauges. All the arrangements for gauging water in the most perfect manner are completed, with the exception of the iron aperture through which the water has to be discharged. It was not completed, because we did not know what quantity of water would have to be discharged. In the meantime, the water has been discharged through a temporary gauge. Therefore, substantially, the clause of the Act relating to the gauge has been fulfilled. The quantity sent down has been less than the quantity provided by the Act of Parliament. I am aware that several actions were brought for not sending down the prescribed quantity. It has always been more than 40 feet per second. I should think it has averaged from 40 feet to 55 feet.

Re-examined: The reservoirs have not at present been capable of being filled to more than half their capacity. While the town has been supplied with 11,000,000 gallons a day, instead of 22,000,000 or 23,000,000, as was anticipated, the millowners have received 15,000,000 a day as compensation. Forty feet per second is about twice the ordinary natural quantity which the Etherow produces in dry weather. It has fallen as low as 11 cubic feet per second. It was often only 20 or 25 feet per second. The continuous supply, which we grant makes all the difference between the water power, being almost valueless and very valuable indeed. I have no doubt the millowners have been largely benefited by our works; their waterfalls are worth twice as much money as they were before those works were constructed. If any allegation is made that the works have been damaged, it is altogether unfounded. Our calculations for the Act of 1859 were formed upon the as-

sumption that 60 inches of rain fell upon the gathering grounds, and that two-thirds would find its way to the reservoirs. The actual rainfall has been 52 inches. Those calculations were based upon the experience of two large reservoirs near Bolton, and upon actual observations as to the rainfall near Glossop, in our own gathering ground. The result has proved that we ought not to have taken so high an average, the rainfall in 1847 being 47 inches, instead of sixty: it was 52 inches in 1848. Supposing we were now coming to Parliament for the first time, I should not recommend the corporation to give more than 55 feet per second as compensation to the millowners; that would be about one-third of the water we could collect, and that is the way in which millowners are now generally dealt with.

By the CHAIRMAN: The average rainfall in the eastern counties is from 16 to 17 inches; in the west, it is 36 inches; near Bolton, it is 60 inches; at Grassmere, in Cumberland, it is 120 inches. The millowners now get a regular and certain supply, instead of an irregular and uncertain one. I calculated that we had rather more than 30 inches of the 47 inches that fall upon our gathering ground. The waste generally is about 15 inches, but in that district it varies a good deal. It has been 20 inches, and it has been as low as 9 inches, according to the season of the year. At the Sheffield Water-Works, where some very accurate observations have been made, the loss is found to be 20 inches. The river is too large to enable the millowners to impound the night water. The corporation impound the night water, so that the mills get it in the most available manner for their purposes.

Thomas Hawksley, Esq., examined by Mr. BURKE.

I agree with Mr. Bateman that it is absolutely necessary to arm the Corporation of Manchester with a considerable sum of money, to carry out the necessary works and provide for contingencies.

Serjeant BALLASIS then opened his case on behalf of Lord Edward Howard. He was not there to stand in the way of any legitimate mode in which the corporation might seek to extricate themselves from their present difficulties; but his appearance, on the part of Lord Howard, was absolutely necessary, in order that the committee might be aware of the real position of the parties, and might know the attempt which had been made by the corporation to commit a gross act of injustice upon his client, and, indeed, to put a fraudulent construction upon the Act of Parliament by which they professed to be guided. By the Act of 1847, the corporation had power to take water from the Etherow, and, by the same Act, they were bound to make a compensation by means of water to be discharged from their reservoirs. By the Act which the corporation obtained in 1854, they obtained power to agree with certain parties mentioned to send down a less quantity of water than was originally provided. (The learned counsel read the clause referred to, and contended that the parties mentioned were merely trustees for the conservancy of the river.) The corporation had chosen to view them in another light, and had bribed them, by large sums of money, in the way of compensation, to betray the trust which had been committed to them. The occupiers of these mills had thus received a compensation for a diminution of the supply *in perpetuo* which Parliament could never have intended, and thereby the interest of Lord Howard, who was a large proprietor, had been greatly injured. When fresh powers were sought from Parliament, the way in which former powers had been applied was always an item for consideration. He could not, after the evidence which had been given, oppose the preamble of the bill, but he must ask that it should only be passed conditionally. The nine persons mentioned in the Act of 1854 were the only persons entitled to sue for penalties. That power had now passed from their hands, and Lord Edward Howard, and the other proprietors, had no guarantee that even the diminished quantity of water would be sent down. He must, therefore, ask the committee not to pass the preamble, without giving to any occupier on the Etherow the power of sueing for penalties, if he could prove that he had sustained damages.

Mr. HAWK, agent for Lord Howard, proved that his lordship possessed upwards of seven miles of river frontage upon the Etherow, and, to a great extent, he was the owner of the bed of the river.

Mr. CLARK contended that the parties mentioned in the Act of 1854 were trustees from the fact that other persons, not so named, had brought actions for damage against the corportion, and that their claims had been settled. If the committee passed the preamble, the only way in which they could secure the rights of the mill-owners would be by having a permanent and fixed gauge, and also providing that the prescribed quantity should be sent down.

Sir DUNCAN MACDOUGAL then addressed the committee. He said he was owner of the Chadkirk Mills in 1848 and 1854. He never heard of the Acts procured by the corporation in those years till after they had passed. His mills had been greatly injured in consequence. He therefore submitted that a clause should be introduced, granting compensation to all owners or occupiers of mills on the Etherow and Goyt, and that ample powers should be given for the recovery of penalties for the nonfulfilment of the obligation to send down the requisite supply of water.

Mr. *Lyddal* examined.

I am now one of the occupiers of the Chadkirk Works, and have managed them for the last ten years. We have suffered injury in consequence of the corporation works under the Acts of 1848 and 1854. We have had to erect a steam engine in consequence, at a cost of £200, and the cost of working it has been £280 per annum. That has been occasioned by the abstraction of large bodies of water. The Chadkirk works are a mile and a half below the junction of the Etherow and the Goyt. The purity of the Goyt has been decreased by the decrease of the body of water. We had no notice of the intention of the corporation to apply for the Acts of 1847, 1848, and 1854, and we never heard anything of them till after they had passed. We have been obliged at times to stop the works, in consequence of the abstraction.

Cross-examined: The last mill on the Etherow, above the Goyt, is the Comstall print works. They have large resererrvoirs, and are quite able to store all the water that comes down the Etherow during the night in an ordinary season. I do not know that the drainage of the Goyt is 60,000 acres, and much larger than that of the Etherow. If it could be proved that the ordinary natural flow in the Etherow was not more than 20 cubic feet per second, and that the corporation had sent down 50 feet, I should still think that damage had been caused by the corporation works.

Re-examined; Before the Etherow runs into the Goyt, the Etherow is the largest. My mill is 150 horse power. I pay a rent of £500. Before the corporation works were constructed, we used to have an ample supply, even in times of drought.

This concluded the evidence for the opposition.

The CHAIRMAN: The opinion of the committee is that the preamble is proved.

The clauses were then read and passed *seriatim*.

Serjeant BELLASIS proposed a clause which provided that any mill owner or occupier on the Etherow, should have power to recover penalties if the corporation failed to send down the prescribed quantity of 55 feet per second.

After some discussion, this clause was agreed to, and passed.

THURSDAY, MARCH 15.

MANCHESTER IMPROVEMENT BILL.

Mr. HOPE SCOTT and Mr. BURKE appeared for the promoters; Mr. DENISON, in support of a petition against the bill, signed by 270 gas consumers in Manchester.

Mr. HOPE SCOTT said the principal object of the present application was to enable the corporation to widen Mount Street and David Street, in Manchester, by giving a compulsory power to purchase certain lands and houses required for that purpose. The improvements were allowed on all hands to be necessary and beneficial, and so far there was no opposition whatever to the bill. The estimated sum required was £24,000. The corporation had, by their Gas-Works Act, power to apply the surplus profits of the gas-works to the improvement of the town, and that was the source from which they proposed to pay the £24,000 in question. It was against that circumstance that the whole of the opposition was directed. A number of gas consumers had thought fit to come before the committee, and ask for the consideration of matters which were only fitted for the courts of law and equity, and to ask for the gas accounts and details of management, the proper place for the production of which, if they really had any grievance, was before one of the masters in chancery. In a petition containing 46 paragraphs, they had brought forward all sorts of complaints against the management of the gas-works, and the application of the profits to the improvement of the town. This, of course, was the way in which the petitioners endeavoured to fix on this particular bill a right to be heard before the committee. His answer was, that this bill did not authorize any further outlay for improvement out of gas receipts, because the power to expend the whole of the profits in that manner already existed. The only question raised was, whether those improvements should be facilitated, by giving compulsory powers of purchase to the corporation. The petitioners proposed the repeal of previous Acts, and asked that no further outlay should be permitted until the gas accounts had been investigated and audited. In fact, it was one of the numerous attempts, whenever a bill was before Parliament, to hang upon it a local grievance having nothing whatever to do with the bill itself, and endeavour to bring it before the Legislature. The learned counsel read some of the allegations in the petition, and contended that, upon such grounds, the petitioners could have no right to oppose the bill.

Mr. *Heron*, the town-clerk of Manchester, then gave evidence as to the nature of the contemplated improvements, and said the amount required would be £24,000.

Mr. DENISON said he should have to call attention to the case for the petitioners in detail. By the Consolidation Act of 1851, the corporation were authorized to levy rates for improvements and other purposes. Though the gas profits were authorized to be spent on improvements, they were not the only funds for that purpose; and the complaint was that a great deal more money had been spent out of the gas-funds than ought to have been spent, and the price of gas had been unduly kept up in consequence. The petitioners alleged that it was intended to pay out of the gas profits the whole expense of widening and enlarging the streets, and one-fourth of the expense of removing obstructions, and widening and deepening the bed of the river, which would together amount to a very large sum, not named in the said bill. There had been eleven reductions in the price of gas in Manchester between 1830 and 1847, reducing the price from 12s. per 1000 feet to 5s. 9d., and increasing the profits from £6000 to £37,000 for the year, and in the latter year the price was reduced to 5s.; but no further reduction took place from 1847 till 1859, when a reduction to 4s. 6d. was determined upon, to take effect in 1860; and in the meantime the gas profits were stated, in the corporation accounts, to have risen, in one year, to nearly £60,000. Since 1847, the reduction in the price of gas thoughout the kingdom might be taken at about 1s. 10½d., whilst at Manchester the reduction had only been 6d., and that not yet in operation. The reductions in other places had been made by trading companies generally, authorized by their own Acts of Parliament to divide £10 per cent. profit before making any reduction; and in Manchester, the gas-works being held for the benefit of the ratepayers, the petitioners thought that they should not be charged so high a price, as if they were supplied by a trading company whose object was profit. The gas profits had, for many years past, been applied by the corporation in supplying the great deficiencies in the water-works' revenue, amounting, in eight years, to £140,000, and in paying for the widening of the streets and other improvements, professedly for the general benefit of the ratepayers who were gas consumers only. In the meantime, the debt on the gas-works had increased every year, from £67,000 in 1845, to £308,000 in 1859. The high price of gas had been maintained in order to increase the gas profits, and the gas-consuming portion of the ratepayers had, in consequence, been paying all the expenses of improvements, without any contribution from those ratepayers who were not consumers of gas. The effect of this was practically the same as if each ratepayer were rated, for the purposes of improvements, in the proportion of his gas consumption, and not in proportion to the value of his rateable property; so that a non-consumer paid no improvement-rate, and some consumers paid as high as 5s. in the pound, whilst a neighbour, with property of equal rateable value, paid only 2d. in the pound. Timber-merchants, coal-merchants, carriers, commission-agents, wharfingers, builders, slate-merchants, and others occupying valuable premises, were very small gas consumers; while the shop-keepers, publicans, cotton-spinners, and manufacturers, were not only large ratepayers, but large gas consumers, and from one-third to one-half their gas payments were gas profits, and applied to relieve the rest of the ratepayers from rates. It was the opinion of the gas consumers that this irregularity in the levying of money for improvement purposes was manifestly unjust, and ought no longer to be permitted, much less to be extended, as was proposed by the present bill. They submitted, in their petition, that the price of gas in the city of Manchester ought to be greatly reduced at once, and that further reductions should be made, as the debts already charged upon the gas-works were paid off. The facility of charging the gas-works and revenue for improvement purposes had induced a greater expenditure than the accounts of the corporation seemed to warrant; for, in 1851, with a gas rental of £93,000, the surplus profit for the year is stated at £37,500; but, in 1859, with a gas rental increased to £141,000, the surplus profit for the half year is stated to be only £10,690. Since the gas-works came into the hands of the corporation, their accounts showed that they had drawn, as profits from that department, upwards of £600,000; but these accounts did not afford certain information, either as to the real amount of surplus profit each year, or as to the state of the different portions of the mortgage-debt and sinking-fund, authorized by the different Acts, on the capital employed, and a statement of account for the year ending June 24, 1859, was printed by the corporation, showing less surplus profit than another printed statement for the same year, which they afterwards published. In the opinion of the petitioners, the works called improvements had been undertaken without proper estimation of the

expense, and had frequently been made in parts of the township of Manchester where least required, to the neglect of improvements urgently called for in other parts of the township. The total amount authorized to be borrowed, on security of the gas-works, under their several Acts, was £585,000, and the sum of £12,500 ought to have been set aside each year since 1845, or since the exercise of the borrowing powers, as a sinking-fund for the redemption of £250,000 of that debt, and one-twentieth of so much of the remaining £335,000 as, for the time, was owing, ought to have been set aside each year for the like purpose. Nothing like such an amount had, however, been applied to this purpose; for, instead of reducing the debts to the extent required by the Act, the gas-rents had been applied to the general improvement and water-works purposes. He (Mr. Denison) was aware that there was a clause in the Act which, the corporation contended, enabled them to appropriate what sum they pleased to the purposes of improvement. If this large amount ought to be applied to improvements, the accounts certainly ought to have been audited. The thirty-seventh section of the Municipal Act required that, on the 1st of March each year, two duly-qualified burgesses should be elected as auditors; and, by the ninety-third section of the Municipal Corporations Act, all accounts and vouchers were to be submitted half-yearly to the auditors; and, after the auditing of the September accounts, a full abstract should be made out and printed, and sold to the ratepayers. It appeared, however, by the gas accounts of the corporation, that the gas accounts had not been audited for many years, and that the accounts of the corporation generally had not been properly audited, as required by the Municipal Corporations Act. Under these circumstances, it was not expedient that any further expenditure for improvements, out of gas receipts, should be authorized; and no further outlay for improvements under existing Acts, on the credit of the gas revenue, should be permitted, until the accounts had been thoroughly investigated and audited, and the amount overpaid to the improvement committee and water-works committee ascertained, and the several sinking-funds reinstated to the position and amount required by the Acts, and until the debt on the gas-works was reduced to the value of the permanent assets. The petitioners further stated that there were upwards of 50,000 houses in Manchester in which gas was not consumed. These were principally inhabited by the labouring classes, and represented about a quarter of a million of the inhabitants, who contributed either directly, or through their landlord, to the rates of the city. Habits of industry, sobriety, and economy would be greatly promoted among this numerous class, if gas were supplied to them by meter, on such terms as might be practically available to every respectable workman. There was no difficulty in so regulating the terms of such supply as to make it profitable to the gas-works of the corporation, and a very great boon to the bulk of the manufacturing population. These allegations formed the substance of the petition, and nothing had been said to contradict them. He asked the committee to consider whether, if those allegations were true, these matters ought to be gone into or not? If the committee thought that, if this case could be sustained, something ought to be done, then he hoped the petitioners would be allowed to prove their case before the committee, which they were prepared to do.

Mr. HOPE SCOTT, in reply, pointed out the small number of the petitioners compared with the great mass of gas consumers in Manchester; it was surprising, if the grievance were such a one as was represented, that there was not a larger number of complaints. Mr. Denison had stated that there were, by the Act of 1855, other funds applicable to improvement, besides the gas profits. There was, however, nothing of the kind in the Act, and the gas profits were the sole fund applicable for such purposes. The principle was a very just one—the improvements were generally for the benefit of the wealthy portion of the population, and they were the very persons who consumed the most gas, so that the persons who paid were practically those who derived the benefit. The learned counsel was interrupted in his argument by

The CHAIRMAN, who said it was the opinion of the committee that the petitioners had no right to be heard.

The clauses were then read and passed.

MONDAY, MARCH 5.

PURIFICATION OF THE SERPENTINE.

The Select Committee appointed to inquire into the best means of purifying the Serpentine, commenced their labours this day. The committee consisted of the Right Hon. W. COWPER, First Commissioner of Works, Chairman, Captain Archdall, Mr. Beach, Mr. Blackburn, Mr. Byng, Mr. Algernon Egerton, Lord Fermoy, Mr. Joseph Locke, Lord John Manners, Sir Joseph Paxton, Sir Morton Peto, Sir Matthew Ridley, Sir John Shelley, Sir Frederick Smith, and Mr. Walter.

The following evidence was taken:—

Thomas Hawksley, Esq., C.E., examined by the CHAIRMAN.

When I was consulted by the late First Commissioner of Works, it was with respect to the purification of the water in the Serpentine, and it was at the same time intimated to me by him that he could not propose to the House of Commons to take a vote for the large sum necessary to alter the bottom of the river. The instructions to me were to make an examination of the state of the water in the Serpentine, and the First Commissioner desired that my opinion on the subject should be given to him in as short a time as possible, as the session was approaching its termination. I told him there were some difficulties in the way, arising from the want of information on the subject; and there would be a considerable amount of data to get up, particularly with regard to soundings, and things of that kind. He said he would furnish me with those particulars from the office, as they had almost everything they required. Two days afterwards, I was supplied with them, and I immediately proceeded to make the investigation of the state of the water in the Serpentine, the result of which was stated in the report laid before the House. The day I received the intimation from Mr. Bonham Carter that Mr. Fitzroy desired to see me was the 7th of July last; the papers reached me on the 9th, and my report was sent in on the 10th, in the first instance, in draft, to ascertain whether it contained all the particulars which the First Commissioner required; it was returned to me on the 19th, and was fair copied and sent to the Board on the 20th. So far as the purification of the water of the Serpentine is concerned, it may be inferred from my report, that I do not consider it necessary that the mud at the bottom should be either covered over or removed, as it has no effect upon the water, which has been ascertained by chemical analysis and other tests. The quantity of organic matter held in solution by the waters of the Serpentine is remarkably small, being little more than two grains in a gallon, and the saline matters are almost precisely the same as in the ordinary Thames water. I have not been called upon to make any analyses in addition to those of Mr. Spencer.

The CHAIRMAN: Are we to infer from your report that the question of preventing danger to bathers and skaters by inequalities in the bed of the river, was one that might be treated independently of your plan of purifying the water?

Witness: Quite so, and you will find that I have a spontaneous note at the end of the report, which arose out of some conversation which I had with the First Commissioner on the subject. I was desirous to let him know that though I was only engaged to purify the water of the Serpentine, I had not failed to consider this matter. That note applied to all the water except the part above the bridge, which is extremely shallow, and where no bathers at present are allowed to go.

The CHAIRMAN: You had better explain your plan to the committee.

Witness: I examined the water of the Serpentine in all parts, and on various occasions, and the conclusion I came to from the long experience I have had in these matters, and also from the result of the chemical analysis which had been made, was that practically the lake was pure, but that it was very much loaded with filaments of confervæ and the lower order of vegetation, and, therefore, I was induced to try a very simple experiment to see whether I could strain them off; I found that I could, and that I got very good water. When I speak of Thames water, I do not refer to the river as it passes through London—I scarcely call that Thames water; I meant that the Serpentine was practically as good as the water supplied by the companies after filtration, and contained not more than a couple of grains of organic matter per gallon. What I wished to remove from it was the organic matter not held in solution, which, as I said before, consisted of fibres of the confervæ plant and small navicula, almost microscopic, and many of them quite so. It is the presence of these plants which gives the green tint which we see in reservoirs; they are very common; we know all about them, the nature of the circumstances under which they occur, and how to remove them.

The CHAIRMAN: Did you find that this vegetable aquatic growth pervades all the water from the bottom of the bed to the surface?

Witness: It is dispersed through the whole of the water, but grows more on the margin where it is exposed directly to the agency of light and heat. If you could make the water much deeper than it is, you would have nothing of it except on the margin of the lake. In reservoirs or water-works, where the water is pumped in the purest state from wells, these things make their appearance with most extraordinary rapidity. At the Liverpool reservoir, the water could not be kept a fortnight, although pumped out of the sandstone rock. The chalk water is also liable in the same way, and a reservoir filled with that water will, in a very few days, become loaded with them. Hence, we are obliged, where these waters are now employed, to arch over the reservoirs. The purest hard water which contains much carbonic acid gas, if it is exposed to light and heat, produces these aquatic plants, especially where there is the presence of a considerable quantity of earthy salts. Having ascertained that there was no noxious matter held in solution in the waters of the Serpentine, I directed my attention to the best means of removing with facility and economy this aquatic vegetation. By my system of filtration, I expect that the whole of it will be deposited as scum. The amount of that scum in weight will be practically nothing, because there is no mud in the water; it is only this small filamentous matter. When the filter becomes blocked up with it, the water is allowed to fall away from the surface of the sand, about three-eighths of an inch of which is then removed and taken to a convenient place where it is washed, and clean sand is sprinkled on the surface. The whole operation would take from two hours as a minimum, to three hours as a maximum.

The CHAIRMAN: Although you could not form an estimate of the weight of such material as filaments of confervæ, have you made a calculation as to the extent which would be covered with it in a certain period of time—for instance, what quantity of water would have to pass through the sand of the filter before it became stopped up by the deposit of vegetable scum?

Witness: That would vary according to the period of the year. When the weather is very bright, for these things grow most under the stimulating action of light, they would require more frequent changing. The filter-beds would be cleansed in succession, the whole about once in three weeks, or in the worst of circumstances in a fortnight. It would be done between the hours of five and eight in the morning, and would produce no nuisance, the water with which the sand was washed would run off into the Ranelagh sewer, a communication being made for the purpose. There would be nothing to be carted away. The expense of cleansing the filters is so small that I scarcely know how to estimate it; it would be merely the labour of three or four men during those hours in the morning. The medium of filtration is washed sand, which reposes upon layers of different sized gravel, beginning with small shingle at the top, so small as not to allow the sand to pass through, and so on until it arrives at loose stones as large as this inkstand. The water passes through drains at the bottom, and so finds its way into the Serpentine. This system of filtration would not have a very material effect upon other matters than those held in suspension. (Witness explained by reference to diagrams the *modus operandi* of purification proposed by him.) The quantity of water that would pass into the filter-bed is 2,000,000 gallons per day, besides the supply to the jets. The water is taken from the lower part of the Serpentine by means of a brick conduit, which is laid at an inclination to convey 2000 gallons per minute. The depth of the Serpentine at that part is eleven feet to the mud. The entrance to the conduit is near the surface of the water, as this filmy matter is continually rising, especially in hot weather. The conduit will be always full, as it is made larger than necessary, to supply the quantity of water required. There would be no sensible current produced in the Serpentine by any conceivable quantity of water being abstracted and poured in again. Lakes of this kind are always in a state of agitation, and, consequently, all soluble organic matter contained in them becomes oxydized and destroyed. If you were to put ten million gallons of water into a lake of this magnitude, you would produce no sensible current. As it is a mile in length, the effect of putting that quantity of water in every twenty-four hours would be to move it a tenth part of a mile in that period. If you were to put in the whole 10,000,000 gallons, it would only move its whole length in that time.

By Lord FERMOY: When I received the instructions of the First Commissioner, I not only took into consideration the depth of the mud in the lake, but that which was the most important of all—the character of that mud, and if I had found it undergoing decomposition, I should, in all probability, have recommended some other more expensive steps to be taken. But I found the mud had passed through that stage, and that, instead of making the water impure, it had a neutral effect upon it. The extent of the mud is enormous—200,000 cubic feet—averaging perhaps eight feet in depth; I do not lay it down as a general proposition that eight feet of mud at the bottom of a lake has no deleterious effect upon the water; because, when it is undergoing decomposition, it is deleterious; but afterwards it is so much inert matter. The water after passing through my filtering process, will become impure again, just as any other clean stream of water poured into the Serpentine would do. It will begin to become so in a very few days, and my

object is to ensure that practically the whole of the water shall be renewed once in every month during hot weather. By the end of the month, the water, though not so green as it is now, will be sensibly tinged with that colour. It is not possible to make a pure lake of the Serpentine, even if supplied at the upper end with 2,000,000 gallons of well-water daily that has never before seen the light; it would become green at the lower end in at least the same time as if supplied in the manner I propose. The Ranelagh sewer does not discharge into the Serpentine on more than three occasions in the course of the year, and then only for two or three hours—probably not more than half that time. There is a great mistake in reference to this matter; the circumstances are simply these: the stream which formerly ran in at the head of the Serpentine became very much fouled, and a sewer was made along the Uxbridge Road to divert it. In process of time, as the buildings in that direction were largely extended, a weir was constructed to allow the water to overflow into the Serpentine in case of heavy storms, which occur, perhaps, three times a year only. But even this state of things is not to continue, for the Board of Works are about to make the middle level sewer, which will take the waters to a large extent eastwards; and, in addition to that, a sewer is about to be constructed across the park, and of course the inlet to the Serpentine will then be blocked up. When the Serpentine was formed, it was the natural valley of the Ranelagh brook; and in the reign of William and Mary, the lake was formed by blocking up the lower end of the stream where it issues from the Park, and the valley was closed in by an embankment. As a matter of course, a great deal of vegetable matter came down the brook, and also some mud—the two together are deposited at the bottom of the Serpentine; and the accumulation went on until within the last twenty years. I think the first sewer was made so far back as 1810, which diverted a portion of the matter; but from the time of the first formation of the lake it has never been completely cleansed. Then, as the houses in Paddington became largely occupied, there was not only the vegetable matter and clay of the district, but a great deal of water-closet matter and foul water sent into it, which formed large deposits, and especially at the upper end. Of late years, the water has been better than it formerly was. The conduit which I propose to construct is laid at an inclination, and it terminates in a well or cistern which, being partially exhausted by the engine, creates a difference of level, and the water flows in. The total cost of the engines, pumps, and filtering process, will be something under £300 a-year. The engines, which are very small ones of 15-horse power, will be in duplicate, so that in case of accident to one, there may be no cessation of the works. There will be one pump each for the filter-beds, and one pump each for the fountains. I have supplied the whole town of Nottingham with one engine, and without any mishap whatever. The upper end of the lake is very shallow; there are not six feet of water upon the mud, and the consequence is that it deteriorates much faster than at the other end. The lake in St. James's Park is shallower than that, and becomes impure faster than in the Serpentine. Last year, it was in a frightful condition, particularly at the latter end of July, during the whole month of August, and in September. I took some persons to look at it, and amongst others, gentlemen from the Board of Works. If you could make the water in the Serpentine ten times as deep as it is, it would be much better.

By Captain ARCHDALL: I admit that, to a small extent, the Serpentine was in an offensive state, which arose from the discharge into it of a quantity of fœcal matter. Then, too, there is the same kind of smell which you perceive on the sea-shore as the tide recedes, which arises from the growth of vegetation; as I have mentioned, my object is to remove the impure matter which is held in suspension, and to leave nature to deal as she is dealing with those that are in solution. Where there is a large expanse as there is here, those matters are oxydized with amazing rapidity. The vegetation which I have referred to grows very rapidly. At Nottingham waterworks, we have an engine which brings in half a million gallons of water daily, from the gravel which has never seen the light at all, and I have known a stalk of confervæ 18 feet long produced in it in forty-eight hours. In the Serpentine, all the detached portions of this vegetation, which are those that give the green tint to the water, will be removed, at the rate of one-thirtieth part per day; the other portions can only be removed by some alkaline matter, as quick lime; no sort of water that we can put in will have the least effect upon it. The mud, if stirred up by the bathers, subsides directly, without affecting the purity of the lake. The possibility of obtaining 2,000,000 gallons of fresh water daily to pour into the Serpentine, was considered a very important point, and I was desirous of knowing the public feeling, of finding other water, not that I thought it would be purer, but more agreeable to the public. The plan I propose will be as effectual as the substitution of any other equal quantity of water would be.

By Sir MORTON PETO: When first introduced to the late Chief Commissioner, he stated spontaneously, as a reason for the instructions given to me, that he was not prepared to face the large expenditure necessary for levelling and filling up the bed of the river to a certain extent. The amount for that purpose has been variously estimated at from £30,000 to £40,000, but those estimates are not correct, as regards present circumstances, because it is quite possible at this time to get the material very cheaply—perhaps for nothing. There are three sewers about to be constructed, from which they could be obtained, and also the Metropolitan (under-ground) Railway. They would be glad to put the earth they remove into the Serpentine for nothing, and perhaps give something to be allowed to do it, as there is no place to deposit it, except at a large expense. It is not in my knowledge what the estimates before the late First Commissioner were for the filling up of the bed, irrespective of the purification.

The CHAIRMAN: You might refer to the last paragraph of Mr. Page's report.

Witness: But that relates to other works. Mr. Page proposed to construct an island of the mud. My impression is, that if the bed were to be filled up to the depth of five feet, none of the mud at the bottom should be removed, except at the upper end. Where it is deep enough, I would not advise that the mud should be touched at all.

By Sir J. PAXTON: To deal with the Serpentine, for the sake of the bathers, is to put the matter upon a new footing. I believe they are not there by right at all, but they have been allowed to use the water in such state as it was. I should have to consider the wants of the bathers under two aspects: there are, first, the little boys and men who cannot swim; and then there are those who can swim. I should also have to consider the best place at which to allow them to bathe. I have paid a great deal of attention to the subject, and my own opinion is, that they should be allowed to bathe in the part above the bridge, and that that part should be made suitable for the purpose, and planted round, and that the rest of the Serpentine should be left untouched. That would not be a very expensive operation, and, to my mind, it would effect the necessary object. (Witness explained, at some length, by reference to plans, the mode of purification which he proposes to carry out, and the position of his filter-beds, &c.)

By Mr. WALTER: There are springs in the Serpentine, and there is a considerable surface-drainage into it from the park; and there is also a small supply of water by the Chelsea Water-Works Company by the overflow from the round pond.

By Lord J. MANNERS: I have come to the conclusion that the mud in the Serpentine is innocuous, from experiments made by myself and Mr. Spencer. There is also a very good test, which we can always obtain, from observation, for, if the mud were in a putrescent state, and were fermenting, gas would be given off, and be seen in bubbles upon the water, when the barometric pressure is reduced. I have watched for these bubbles coming up under various circumstances, and have found there were none. There were some in the shallow part at the upper end, near the inlet to the sewer. The mud stirred up by the bathers produces no injurious effect upon the water nor upon the air.

By Mr. LOCKE: The mud is reduced chiefly to a carbonaceous condition; it contains a little phosphoric acid and a little sulphur, and at the bottom of the water it has no injurious effect. It would be a very different thing if exposed to the atmospheric oxygen. If it were made very hot, no doubt it would evolve sulphuretted hydrogen, and perhaps a little phosphuretted hydrogen. I know of no other process of purifying the water of the Serpentine than the one I have proposed, except by bringing in other water in equal volume. Water drawn from a well containing salts of lime and magnesia will produce this vegetable matter, and it is this which gives the peculiar mawkish smell to the water in the Serpentine. At the upper end, where the sewer comes in, there is a fetid smell; but, wherever the margin of a river is fringed with the confervoidal forms of vegetation, it will always produce that peculiar smell which is perceptible on the banks of a stream, especially in the evening. It would not in the slightest degree remove this vegetable matter from the margin of the Serpentine, whatever quantity of water were poured in, because of the heat and light to which it is exposed. The depth of water in St. James's Park is, I think, four feet; the water itself is obtained from a well sunk in an island on the lake itself, and pumped up by an engine. On the margin of that lake, the same vegetable matter is to be found as in the Serpentine. I expect much greater advantages to the water itself in the Serpentine, by the process I propose to adopt, than has been obtained in St. James's Park; but, as to the bottom, and the bathing and skating, there will be no effect whatever. The soil from which the well in Duck Island draws its supply is full of cesspools; there are also a vast number of sewers which, being below the level of the Thames, are tide-locked, and the water is no doubt very much contaminated by these sewers and cesspools. The water at Trafalgar Square, which is drawn from the same sand and gravel basin, contains 60 or 70 grains of impurity in a gallon. The amount of deposit in my filter-beds, would be only about an eighth of an inch in three weeks; but, in order to clear it away, I should remove three-eighths of an inch which would be replaced directly. This would produce no effect whatever upon the gravel and larger stones beneath, and I do not anticipate that they would ever require to be removed. If the bed of the Serpentine were filled up to a depth of four or five feet, the water could not be kept pure by any other means than that which I propose, and I ought to mention, because it is material to the decision of the committee, that the shallower you make the water the more rapidly it will deteriorate.

By Sir M. RIDLEY: It is not possible for any deposit to take place in my culvert; it will be always running full with considerable velocity, and there will be no mud in it. No doubt, if a well were sunk 140 or 150 feet to the chalk, a small quantity of water could be obtained from that source—perhaps 200 or 300 gallons per minute; but that would be of no better quality as far as the growth of this kind of vegetation is concerned, and the quantity of water obtained would not be such as to justify the expenditure. The water in the Serpentine last summer was better than that in St. James's Park, but there was this difference, that in the latter the vegetation is more broken up by the bathing, and the filaments become more diffused through the water; whereas, in St. James's Park, there were masses of it several feet in length.

By Sir F. SMITH: My estimates for carrying out this plan are not likely to be exceeded. There are some alterations which have been made in my plan of an entirely architectural character, and which are not included in the contracts, and will add some £350 to the expenses; but no order has been given for them at present. The proposal for this alteration originated from the Board of Works; but the buildings have not yet arrived at that stage at which any alteration could take effect. About one-half of the sculpture is already done. The total cost of the sculpture, speaking from memory, is £1450; but that sum forms a part of the £13,020. My estimate for the works was £16,500; but the contract was taken below that. The total expenditure to the present time, I should think, would be about £8000; and to that would have to be added the contractor's compensation for loss of profit, if the works were to be now suspended. The design for the sculpture was suggested by me, and worked out by Mr. Thomas; it was then submitted to the Board of Works, by whom it was slightly varied. The principal portion of the material employed is Portland stone; but some portion is Sicilian marble. With reference to the water in the Serpentine, if it were left for the next ten years without anything being done to it, it would not be worse than it now is.

By the CHAIRMAN: I believe the design for the engine-house was approved generally; but it was thought that something more ornamental was desirable, if the funds at the disposal of the board would admit of it; and, as the contracts were taken below my estimates, it was considered that the alterations might be carried into effect.

By Sir J. SHELLEY: The analysis of the water in St. James's Park, to which I referred, was taken before the recent works there were executed; but the water is practically the same, if taken at the same time of year. The whole of that water is contaminated by filtration of matters from the surrounding cesspools through the soil. I am not aware of the details of Mr. Spencer's analyses of the water in the Serpentine; but I have no doubt they were made with sufficient care to justify me, in connexion with my own observations and experiments, in basing my report upon them. I inquired of Mr. Fitzroy whether he wished to have a chemist called in, and he said he did not think it necessary; but, when I went on to the ground to conduct my own examination, I felt it would be desirable, in a public point of view, and also for my own information, that it should be done. I therefore asked Mr. Spencer to assist me. In my calculations, I have not allowed anything for evaporation. I can tell what the quantity is; but against that must be set the rainfall; because, practically, the Serpentine is an overflowing lake to a very large extent. The maximum evaporation in England is a quarter of an inch per diem. I should take it here at 1-10th of an inch; but the drainage, and rainfall, and springs, more than make up for that. There are from fifty to sixty acres draining into the Serpentine, and I do not propose to cut off any portion of that. There is a contract with the Chelsea Water Company, terminating in about three years, for a supply of water to the Serpentine by measure. The quantity, I believe, is 6800 tons, and the price for that supply varies. Up to a certain quantity, it is £2. 10s. per 1,000,000 gallons; then £2.; and then 25s. At the present time, the total yearly amount is very small, as the company have been obliged to remove their works to Hampton, and the engines which formerly supplied the Government have

been pulled down. My estimated yearly working cost is £300; but that does not include the supply of water from the Chelsea Company, if the continuance of that supply should be necessary. I am not aware that the contract with the company was entered into originally because the Serpentine became lowered by evaporation several inches below the overflow. The whole of my filters will be in use at the same time during the summer; but I do not think it will be necessary at other periods of the year.

By Sir J. PAXTON: I think the £8000 I mentioned as the actual expense already incurred, would include the steam-engines, which have been ordered, and are far advanced in making. If the works were to be now suspended for a fortnight, I think £100 would cover all the compensation which the contractor could reasonably claim; but it is difficult for me to have to say, because I am the arbitrator between him and the Government, in case of dispute.

By Captain ARCHIBALD: The contractor would be relieved from penalties for non-compliance with his contract, because there is a power reserved to the engineer in the specification to extend the time, if he thinks it necessary.

By Sir JOHN SHELLEY: I do not see any objection whatever if the committee desire that the works should be so suspended.

By Mr. LOCKE: I think there would be no practical inconvenience if the works went on till Friday next, especially as I think I can satisfy the committee that, whether the works go on in the way proposed or not, all the rest can be made available, whatever plan may be adopted.

WEDNESDAY, MARCH 7.

T. Hawksley, Esq., recalled and examined by Sir J. SHELLEY.

Sir J. SHELLEY: There is one part of your evidence on the last occasion I should like to have a little clearer. Do I understand that, before anything is done, the water in the Serpentine is as chemically pure as the water supplied by the London water companies after filtration?

Witness: That relates to the quantity of organic matter found in the water, not to the salts. We have had the water analyzed since to see what it is at the present period: Dr. Odling analyzed it. The organic matter at present is 2·96 grains in a gallon of unfiltered water, or one grain in 70,000. The saline matter is 22·24 grains. That analysis bears out my statement that the water in the Serpentine has been better of late years than formerly. I do not know what report Dr. Hassall made in 1851, but it is necessary to state that the sewerage water had not then been diverted. I produce a specimen of the Serpentine water of to-day. The water, the analysis of which I have read, was taken yesterday. I sent up for this in order that the committee might know its actual state. I purpose to day to filter some of that water, and show it you filtered through some of the same sand that is going to be used. That specimen was taken exactly in the middle of the lake, near the Humane Society's house. [The water produced was only slightly discoloured, and contained no sediment. One member of the committee tested it by tasting.] After filtration, the water will be nearly the same as that supplied by the London water companies—that is to say, the water supplied by the London companies contains 18·20 grains of saline matter per gallon; this contains 22·24 grains. Taking the water in that state, and supposing a not temperature in the months of July and August, it would not produce such a stench as to be inconvenient to anybody; and it never has done. At times, a stench has come from the Serpentine there is no doubt, but the water has not produced it. It has been produced by the influx from the sewer, which is about three times a year. There was a large quantity last summer, particularly after the great thunder-storm. There is always in particular states of the atmosphere, what I may call a "marsh odour." That odour may also be observed in ponds in parks, in natural lakes, and on the sides of rivers, when there is a fall in the barometer on a sultry day without the existence of any sewers whatever.

Sir J. SHELLEY: How far does that overflow of sewerage water, which you say takes place three times a year, affect the stench at the lower end of the Serpentine?

Witness: I do not think at the lower end there was ever a stench to be perceptible—not of late years. When the sewerage water was running in, day by day, of course it would affect it. After the filtration has taken place, the difference between the water of the Serpentine and that supplied by the water companies will be about one grain of solid matter in a gallon. If it were poured through two folds of blotting-paper, its appearance would be the same. I think the result which will be gained by this filtering system will be worth the expenditure, because there is a popular feeling in favour of taking out the colouring matter which you observe in the Serpentine in summer; and, besides, it would be more agreeable for the bathers, and persons walking along the banks. Beyond that, I should not think it worth while to expend even this sum of money upon it. No doubt, the popular course would be, to pump fresh water in, if such could be done; the public are quite unlearned in these matters, and ever will be.

Sir J. SHELLEY: Then, if the object were to follow the popular wish, it would be equally gained by a supply of fresh water, as by leaving the water in the state in which you see it there?

Witness: If you can bring in two million gallons a day, it will, except in so far as the cost of doing it would make the project become unpopular amongst those who have to pay for it and do not enjoy the benefit. I turned my attention, in the first instance, to the possibility of doing that. I found it was impossible, and then I directed my attention to the mode of purifying the water without that difficulty. I think every means of supplying the Serpentine with fresh water has fallen under my notice at some time or other; that is, I have considered every possible source. No special plan was ever brought before me by anybody.

Sir J. SHELLEY: Then your reason for putting the public to the expense, little or great, of the present plan, is, that you do not imagine there is any scheme, either proposed or possible, for supplying the Serpentine with fresh water?

Witness: As to possibility I would not say, because I am quite sure it is possible. You might go to the higher reaches of the Thames, and bring in a supply of fresh water, but the expense must fix the limit, and then it is quite impossible. You might get water, to a limited extent, from the chalk, but the expense would be great, compared with the small quantity that would be made available. I have not gone in detail into the question of the expense. The proposal for the supply of water to the Serpentine from the well in Duck Island was never brought before me. I never heard of it till the Chief Commissioner sent me a communication, after I had made my report. I was not aware, till the correspondence was published, that the cleansing of the water in St. James's Park was only part of a general scheme which had been submitted. My report was not based upon the supposition that there were no other schemes. I am perfectly certain there is not the quantity of water in Duck Island; and I am also certain that its quality is such as to render it particularly inadmissible. The possibility of obtaining a supply of water from the sands in London, did not escape my attention. I was intimate with the quality of the water, and I came to the conclusion that it was perfectly unfeasible. I am aware that the water in St. James's Park was filtered from the well in Duck Island. I have not examined into the actual quantity of water produced by that well, because it has never been ascertained, and it can only be ascertained under an order from this committee. If the committee will give me leave, I will undertake to pump all the water out of it. I am not aware of the quantity of water taken out of that well. You may always pump a large quantity of accumulated water out of the gravel; but the question is, what is the yield into the gravel after that accumulation is removed? For a short time, you can always get an enormous quantity of water out of it, perhaps for three months. I do not think there is any place in London on which you could draw for six continuous months—if there is no filtration into it—two million gallons of water per day, or even one million. By filtration, I mean that the water shall be ascertained to run away, and shall not be returned to the source of supply.

Sir J. SHELLEY: Suppose it were capable of proof that, not for three months, but for more than that, there has been a great amount of water pumped out of that well; would not that rather shake your opinion?

Witness: Not in the least; unless I knew it were also pumped away. What I wish to bring before the committee is this. Unless the Serpentine is completely emptied every month, it is no matter what kind of water you put in, you will have the same nuisance, and that will take two million gallons a day. That is the least quantity that would be required. Supposing it could be shown that two million gallons a day of water, which has purified itself by natural filtration, could be supplied by pumping, if the quality were equal, I should certainly be for adopting that method. Dr. Odling has examined the water from Duck Island: the organic matter is 8 grains, the saline matter is 84 grains, making together 92 grains of solid matter per gallon. The hardness of the water is 30° as against 11½° in the Serpentine. That water was taken from the well itself.

Sir J. SHELLEY: Are we to understand by that, that the water being pumped up at this moment from Duck Island is actually more impure than the water in the Serpentine?

Witness: Decidedly.

Sir J. SHELLEY: That you are certain of?

Witness: Dr. Odling is here; he can give you the results.

Sir J. SHELLEY: Yes, it is very important.

Examination continued: That analysis was taken yesterday, the engine being then at work. The impurity is accounted for by vast numbers of sewers passing through it below the tidal level—sewers passing through Belgravia. If I am rightly informed, there are more than a thousand in the district I am mentioning. The area of the filter-beds for the filtration system is 24,000. They are 100 feet by 60, and there are four of them. The medium of filtration is sand, not very fine. It should be coarse for purposes of this kind. It is particularly described in my specification that it should not be fine sand; that does no good at all. The difference between the water of the Serpentine and that of the Thames above Teddington Lock, before it is filtered by the water companies would, I should think, be three or four degrees in favour of the Thames, except as to the organic matter. The organic matter in the Thames in the summer is usually about two grains in a gallon. In the Serpentine, it is 2·96 now; last summer it was a little less, but that might be incidental. There will be 2 feet 6 inches depth of water on the filtering medium. That is about 6 inches more than I generally put upon them. Confervæ would grow upon the surface of the beds in hot weather; they are easily removed by a very simple process. Get a line something like a sash cord, and that drawn over the piece of water catches them all.

Sir J. SHELLEY: I think you stated that, at Nottingham, the confervæ had increased as much as 18 feet in forty-eight hours; would anything like that occur here?

Witness: Oh no. Confervæ grow rapidly in water which has never seen the day from its first coming into the light. It is a well known thing, and in consequence we are obliged to arch over our reservoirs, or in the course of a few days they would become heavy with confervæ, and with vegetation of the lowest orders; in all parts of the kingdom, we arch them over to prevent that effect being produced. In this case, I do not expect anything of that sort would occur to any great extent; bright and pure as that water is, in the course of a fortnight in hot weather in summer, long streams of confervæ come up from the bottom five or six feet long. The filter-beds will be all at work at the same time in hot weather. In the hot weather in summer, we shall have to clean perhaps two in a week. On an average in the summer, they will be cleaned all round once in three weeks. I wish it to be expressly understood, there is no clay or mud in this water at all; we have not that to choke the filters. There is nothing whatever but this fibrous organic matter. The quantity per square foot that would pass through on the first day of pouring on, would of course be the total quantity of two million gallons divided by 240,000 square feet.

Sir J. SHELLEY: That is to say, the water will pass through as fast on the last day as it does on the first.

Witness: No, the quantity to go through, is the quantity the engine-pumps, and the engine will pump the same quantity on the last as on the first day.

Sir J. SHELLEY: Then, before you begin to cleanse the filter-bed, as much water will pass through as on the first day?

Witness: No, that is quite a different thing. As much water will go through the four filter-beds; the one you are going to cleanse will be nearly choked up. They will be cleansed in succession. It is just the same as purifying gas in gas-works. You have four purifiers, and the gas passes through three, so that they are always at work equally in rotation. At the end of three weeks, I should not think there would be half an inch an hour pass through the filtering-bed; it will want cleaning. If all four beds were set at work at the same time, they would not all want cleaning together. That would only be the case at starting. To avoid that, we should begin cleaning one before it was perfectly dirty, so as to get them into rotation, and then it would never occur again. The beds would ordinarily be choked up in about three weeks. In some instances, filtering-beds have choked up in two or three days. In the East London water-works, and on the river Lea, under particular circumstances, the filtering-beds choke with great rapidity. That is partly owing to vegetable growth, and partly to a peculiar matter brought down by the Thames above Teddington lock—a very fine mud containing oxide of iron. The sand used in the filtering-beds will be cleansed by the common process. For instance, you have a large tub or wooden tank with a false bottom; you let the water into that false bottom, and upon that you place a quantity of sand; the water bubbles up violently through the sand, and carries off with it all the dirty matter. If you give the sand a little agitation, the whole thing is done in a few minutes. This process takes only a very small quantity of water, especially if the sand is agitated. I propose to have a band from the engine fly-wheel to work an agitator for that purpose. We should pump the water from the well by the engine, and elevate it to a certain height in order to get the necessary pressure. We should use part of the filtered water for this cleansing process, but the quantity would be perfectly insignificant. It will only be required

at intervals when the filter-beds are cleansing. A filter-bed can be cleansed between the hours of five in the morning and eight. I can only give a very rough estimate of the quantity of water per week that will be required to wash the sand. I should think from 20,000 to 40,000 gallons.

William Odling, Esq., M.D., examined by the CHAIRMAN.

I am a chemist by profession. I am a member of the College of Physicians, and a fellow of the Royal Society. I am accustomed to making analyses of water. At Mr. Hawksley's request, I have examined the water in the Serpentine and the water at Duck Island. I have previously examined the water of the Thames a great number of times. I took the water which I have analyzed from the Serpentine yesterday, between one and two o'clock, from the middle of the stream, opposite the Humane Society's house. I found in it 22·24 grains of saline matter, and 2·96 grains of organic matter per gallon. The hardness was 11·5°, by Dr. Clarke. I followed the ordinary process of analyzing water. It is not absolutely accurate, but it is sufficiently approximate. In order to know the constituents, I should require a fortnight. My analysis, to test the amount of organic matter, yesterday, was, no doubt, hurried. I took the Duck Island water from the pipes where it runs into the stream—from the pump, in fact. That was also taken yesterday. I found 84 grains of saline matter, and 8 grains of organic matter; the hardness was 30°.

The CHAIRMAN: Now, from your experience of Thames water, were not you surprised to find the water in Duck Island so much worse?

Witness: No; all shallow wells I have examined are much worse than Thames water. The amount of saline and organic matter in Thames water within the tidal area, varies very much at different seasons of the year and at different states of the tide. For instance, at high water at Greenwich there has been occasionally as much as 34 grains of organic matter per gallon; but it varies extremely. On other occasions, I have found it as low as 2.

The CHAIRMAN: I think the commission that analyzed the water supplied by the water companies in 1851 found the largest amount of organic matter was in the East London; it was 4·12 grains per gallon.

Witness: That was probably at a higher point in the river; I am speaking of Greenwich. I believe that, out of the tidal influence, the amount of organic matter varies from three-quarters to half a grain only. The amount of organic matter ordinarily found in shallow wells varies from 4 to 15 grains. Of course, if it is near a sewer or cesspool, it gets greatly contaminated. The water I took from Duck Island is continually flowing from the pump. I do not consider, from the analyses I have made, that the Serpentine is of such a character as to give out a deleterious miasma. I will not say there is anything objectionable in the Duck Island water as I found it; what it might become in hot weather, I do not know. I did not look for any trace of vegetation in the Serpentine. I have no doubt I should have found it. I think the present condition of the Serpentine is a guide as to what it would be in hot weather in summer. The mass of green vegetation which is described as being the chief nuisance, only exists in summer. My opinion, judging from the present state of the water, is, that aquatic vegetation would exist in the St. James's water in the summer time, as in all shallow waters. I do not think the hardness of the water makes any very great difference. Copious vegetation is found in water where there is very little salts of lime, but not to the same extent as in harder waters.

Mr. WALTER: Have you ever heard it mentioned amongst medical men that, in cases where persons have been under water in the Serpentine, though not long enough to be drowned, there has been more than ordinary difficulty in restoring them, in consequence of the state of the water?

Witness: I have seen something of the kind in the newspapers. I never heard it. I do not know that, in the case of persons falling into the Thames, they have suffered afterwards from the effects of the water. The smell of the water of the Serpentine is of rather an aguish character. I should not be surprised to hear that there were cases of low fever arising from the malaria. I do not know whether it is so or not, but it lies low, and there is a large amount of vegetation.

By the CHAIRMAN: Thames water, except when contaminated with the sea, does not contain so large an amount of saline and organic matter as the Duck Island water. In the stream that runs at low water in the Thames, there are about thirty grains of saline matter, and three or four of organic.

By Sir M. PETO: I think the large quantity of saline matter found in the Duck Island water is owing to the superficial drainage. I cannot say that the water percolates through from cesspools. The salts are washed out of the soil by the water. I attribute it to that.

By Lord J. MANNERS: I examined the mud in the Serpentine, as well as the water. I did not estimate the water, but the dry mud. I found 67·37 per cent. of sand and carvæ, 23·36 per cent. of matter soluble in acid, principally chalk, and 9·3 per cent. of organic matter. The result of Dr. Lyon Playfair's analysis of the mud in 1848, corresponds very closely with mine. I have taken the top mud. I only made one analysis; Dr. Playfair made a series. His average of the amount of organic matter corresponds exactly with mine. I should say the organic matter in the mud is chiefly vegetable. I should infer that from the larger amount of organic matter in the St. James's water, that there would be more vegetation there than in the Serpentine.

By Lord FERMOY: The underneath mud in the Serpentine is black. The top mud is always red, showing that it is in a healthy condition. It is only the mud in direct contact with the bottom of the water that has any sensible effect. I have not analyzed the water after it is filtered. I took the mud just by Mr. Hawkesley's filter-beds, at the top of the stream. It was not fished up from the bottom. It was taken in close proximity to the sewer hole. The depth of the water was four feet. I took no specimen of the mud below the bridge. I think, practically, the mud does not have any great effect on the water; therefore, my analysis of the mud would not apply to the purity of the water. If I had found the mud rich in animal matter, I should have taken more objection to it. It seems to be of the character of ordinary pond mud. My analysis of the water in Duck Island was necessarily hurried. I could not evaporate more than a pint. I weighed the residue and then burnt it to get the amount of organic matter. If I had made a more careful analysis, the eight grains might have come down to seven.

By Sir J. SHELLEY: But for the overflow of the sewer, the water in the Serpentine is, in my opinion, purer than the water from the Duck Island well. At present, the water of the Serpentine is not impure.

By Mr. WALTER: I think the disturbance of a large body of mud by bathers or otherwise would be injurious. I know that the fish in the Serpentine were destroyed by the introduction of lime. I think that was very injudicious. If you can keep the stream filled with life, you may be sure it is going on well.

Captain ARCHDALL: What effect would the water-fowl have upon the water in St. James's Park? What is your opinion of the result where the water is covered with wild fowl of all sorts.

Witness: I do not know their habit. If they are in the habit of leaving their excreta in the water, they would be injurious; otherwise, they would keep the water in motion to some extent. The decomposition of vegetation has certainly an injurious effect upon the water.

T. Hawksley, Esq., recalled.

By Sir J. SHELLEY: As to the questions you asked me on Monday, with reference to the continuance of the supply of water to the Serpentine by the Chelsea Water-Works Company, I propose after my works are completed to put a stop to that. Indeed, the main portion of it is stopped now. It is only at certain times that it it necessary. It is not required between the months of October and April; of course, there would be no use whatever for water from the Chelsea Company at the present moment, seeing that the water in the Serpentine has been flowing over for a considerable time. That does not take place in the summer time, except when there has been a heavy rain. I do not recollect what was the actual supply of water by the Chelsea Water-Works Company last summer, but it is appended to my report. I think it is about 90,000 tons in the year. The most useful water is that supplied in June, July, and August, when the greatest amount of evaporation takes place. As far as evaporation is concerned, it will be quite immaterial whether the supply by the Chelsea Company is stopped or not. I do not at all imagine that my works will produce any evaporation. There will be no waste from the culvert, for there is place for the water to go; the only exit for it is into the Serpentine. With regard to the watering of the roads, it suits the Chelsea Water-Works Company to take a certain quantity of water from the Serpentine for that purpose; but what they take out is deducted from the supply. Going back to the question of the expense of filtration after the works are completed, my calculation is £249. 8s. per annum. That includes coke, tallow, engine-man, and the expense of cleansing the filters. There would be very little wear and tear in the engine and pumps. In that sum I do not allow any interest for the renewal of engines, or anything of the kind. That would be part of the £17,000. The contracts included nearly everything connected with the works—the engine-house, the filter-beds, the enclosure, the ornamental work, the sculpture, the steam-engine, and the pipes for supplying the fountains; in fact, I may say everything. There are a few things purposely omitted, but there is a margin left in the £17,000, and I hope these additional works will be put in. I wish to add a little more to the sculpture, and have two additional fountains, and make some improvement in the style of the building. The building, as it is, is very neat, but it is not what can be called a decorative building. Those additional works have not yet been approved of by the Commissioner. They are not in the contract; they may never be made, and the money will be saved. The pipes that are now being laid are included in the contract. I hope that the £13,023 is not all that is to be expended upon these works, for I should very much like to see the additions put in. Mr. Thomas's charge for sculpture is included in the contract, but the proposed sculpture would, of course, be additional.

Sir J. SHELLEY: You stated to me, in answer to question 111, that your works would not be useless supposing the present scheme were not carried out, and the contractors had notice to stop.

Witness: I think that is so; for I can satisfy the committee that these works can be made available for any plan the committee may adopt for supplying the Serpentine with fresh water, either from Duck Island or anywhere else. It is no matter what scheme is adopted, they will be an ornament to the neighbourhood. I presume there will be cascades and fountains and such like, and these works are well adapted for that purpose. Of course, if it is simply a supply of water, these works would be of no further use, than that they would be an ornament. But, under any circumstances, I think it would be better to finish them, for it would be more economical than pulling them to pieces.

Sir J. SHELLEY (Pointing to two bottles of water): One of those is of the water from Duck Island, and the other is the water from your works at Leicester—which would you say is the purest, without reference to taste?

Witness: I cannot answer that. If you ask me which water is the brightest, I should say that from Duck Island, of course. You cannot judge of water from its appearance; some water which looks very bright, contains large quantities of sulphuretted hydrogen.

By Mr. WALTER: Supposing you have two bodies of water, a small quantity and a large quantity—the power of filtration being the same—the smaller quantity, passing more frequently through the bed, would, of course, be the purer. Therefore, assuming that the depth of the Serpentine were reduced to five feet, instead of eleven or twelve as it is now, my works would be more effectual as regards the purification of the water. At the same time, if the same system were carried out as that which has been adopted in St. James's Park, I do not think the water could be kept cleaner, for this reason, that the weeds would grow much more rapidly. If the depth of the Serpentine were reduced to one inch, it would be impossible to keep it clean; it would be one mass of green matter. That is an extreme case, and I just give it as an illustration of my point. Supposing the bottom of the Serpentine were glass or marble, the water would not be kept cleaner if you had a small quantity, instead of the large body there is now? The weeds grow upon the surface, and send down their fibres and reach the bottom and adhere to it; and, when you are dealing with large bodies of water like this, you have great difficulties to contend with.

Mr. WALTER: In an answer you gave to a question the other day, you stated that the area of the Serpentine was fifty or sixty acres. Now, is it not the fact that the area of the land immediately adjacent to the Serpentine which might be drained into it by a natural fall is from 400 to 500 acres?

Witness: Most likely such an area might be drained into it. I think the actual area of Hyde Park and Kensington Gardens is nearly a mile. If that area were properly laid for drainage into the Serpentine, the fall of rain being from 22½ to 23 inches, and 16 inches going away in evaporation, there would be about 7 inches that would find its way into the lake.

Mr. WALTER: Should you be surprised to hear that in a piece of water about the same size as the Serpentine, and fed by a surface of land of nearly the same area, no less than eight inches flow into it after a heavy fall of rain?

Witness: I should be not at all surprised at that, and that it would also be the case with the Serpentine; but I understood the question to refer to the amount of water that might be calculated upon in the Serpentine as derivable from the drainage of the adjacent land. No doubt the thorough drainage of Hyde Park and Kensington Gardens would be a beneficial source of supply, and it would prevent the overflow which has been going on for some months.

Sir J. SHELLEY: But that overflow takes place at a time when there is no difficulty in obtaining water. What would be the result in the summer months?

Witness: Generally in the summer months there would not be a very large supply; but, within my knowledge, the Serpentine has overflowed in the summer months after the heavy falls of rain which sometimes occur.

Mr. WALTER: Are you acquainted with the large basins in France—in

the Gardens of the Tuileries and at Versailles? Do you know how often they require to be emptied, in order to keep them clean?

Witness: I am acquainted with them, but I do not know how often they are emptied. The process of emptying adopted in those cases is, however, only applicable to a piece of water with a solid bottom, and would be totally inapplicable to the Serpentine in its present state. You might let off the water in the Serpentine in a few hours, but you would be many weeks in refilling it.

By Mr. LOCKE: I do not think it would be prudent to calculate upon the natural supply of water to refill the lake, in case it might be necessary to run off the contents for the purpose of cleansing the basin. The supposition was, that the bed should be made 5 feet deep; it would therefore take ten times 5 inches = 5 feet of rainfall and drainage, to refill it; so that, by natural resources, the lake would require twelve-months to be restored. If you fill up the Serpentine, and leave the water only 5 feet in depth, you must take some means for keeping it constantly supplied as well as for cleansing the water itself. If the committee decided upon supplying the Serpentine with water from Duck Island, they would have to put up the necessary machinery for providing a constant supply, and the water they obtained from Duck Island would require the same process of filtration as that which I propose for the water now in the Serpentine. Any gentleman who was in the habit of walking in St. James's Park last summer, must have seen that the water in the hot weather was perfectly loaded with impure matter. I have never seen the Serpentine in such a state as the St. James's Park water was at that time. Supposing the committee were of opinion that it would be desirable, for the sake of the bathers and skaters, to fill up the Serpentine to a certain level, it would not be absolutely requisite that in doing so they should previously remove the mud.

The water in that case would, by my system of filtration, be made clear and bright, as the water in that glass, as it left the filter-beds; but, as it passed down the lake to the lower end, the confervæ would grow in it again, and it would be of the same colour as the sample on the table. The drainage of the park might be pumped up by the engines, and made to supply the loss arising from evaporation.

Lord J. MANNERS: You are acquainted with Mr. Page's report of last year. Let me read a paragraph from it. He says,—"From the statement of persons who frequently bathed in the Serpentine before such a quantity of sewage matters had accumulated on its bed, it appears that numerous springs, varying in temperature, were met with; and, although these may have been partially choked up by the overlying mud, they may be recovered during the operations for cleansing the river, and the importance of maintaining the greatest possible supply of water from these sources would weigh against any plan of concreting the bed, which also involves the necessity of drains to carry away these very springs, which otherwise would soften the mud under the concrete and cause its disruption." Do you agree with Mr. Page in that opinion?

Witness: I agree with him to a limited extent, but I think if such springs exist there would be no difficulty in bringing them into the conduit which I propose to construct. I believe that there is no material quantity of water which is prevented from finding its way into the Serpentine in consequence of the overlying mud. The very fact of the bathers having discovered the springs proves that the mud does not prevent them getting into the lake. The report of Mr. Page, however, relates to a past state of things, and not to the present.

By Sir M. RIDLEY: My process of filtration would remove the whole of the organic matters in suspension, but it would have no sensible effect upon those held in solution. I have prepared a plan and calculation in reference to the removal of the mud above the bridge, for the purpose of providing accommodation there for the bathers.

By Lord FERMOY: The difference of level between St. James's Park and the Serpentine is about 40 feet; and, if the plan of supplying the latter from the well in Duck Island were adopted, the water would have to be raised a height of 60 or 70 feet, including friction in the pipes. I do not think you could obtain a sufficient supply by sinking a well at the upper end of the Serpentine. The water from the chalk is very uncertain, and always limited; and I think you could not calculate upon obtaining more than 200 gallons per minute there. The supply from Duck Island would be twice that quantity. The length of pipe through which it would have to be conveyed, is about two miles, and, of course, that would involve considerable expense. It is possible to get the supply in that way, but, in my judgment, it is not desirable. I cannot, at this moment, give the committee an idea of the relative cost of supplying the Serpentine from Duck Island well, and the Chelsea Water Company's mains. In either case, my system of filtration would be more necessary to keep the lake pure than at present. You must either bring in a sufficient body of water to make the Serpentine into a flowing river, or allow two million gallons of water to run away daily, and replace it with fresh. In the latter case, it would be as pure as my system of filtration is intended to make it. It is, therefore, entirely a question of which would cost most. None of the expense hitherto incurred is useless, except the cost of the walls of the filter-beds—say about £1000. The expense of filtering, if the water were supplied from the Chelsea Water-Works, would be precisely the same as if the supply were obtained from Duck Island, except that the latter will produce this vegetable matter more rapidly. Caustic lime would remove this vegetation from the margin of the lake; but I think it would be preferable to restock the Serpentine with fish, and allow it to get more into a natural state. The waste of water by my plan is so small as to be quite insignificant, and is compensated for by the overflow at particular periods of the year. I have made no proposal for supplying any waste. But it can be readily done, if desirable, by sinking a well in the chalk, and pumping up water by the engine. The overflow, which is greatest in the winter time, has the effect of keeping the salts in the lake in a uniform state, which would otherwise make it like the Caspian Sea, by reason of an overcharge of those salts, through the evaporation which goes on. I do not think it is desirable to increase the drainage into the Serpentine for that purpose, because the proportion of salts, at present, is only equal to that in the upper region of the Thames—22 grains in the gallon—and that is not injurious.

By Mr. LOCKE: In the heat of summer, the loss by evaporation is three or four inches, but, by the flush of rains afterwards, it is made up again. If the present plan were abandoned, the Government would have the engines and material to place against the expenses already incurred—plus any sum they might have to pay for breach of contract.

By Sir J. SHELLEY: If 2,000,000 gallons of water could be supplied daily from the Duck Island well to the upper end of the Serpentine, and the same quantity were allowed to flow over the fall at the other end, the system of filtration would be quite useless. The entrance to my culvert is placed near the surface of the water, because the largest portion of the vegetable matter proposed to be removed is at the surface; but you can draw from any part by this culvert.

By Mr. WALTER: There is no formula known to the profession which expresses the relation which the purity of water bears to its depth. The present average depth of the Serpentine is almost precisely six feet six inches; if the depth is reduced to five feet, the quantity of water in the lake will be as nearly as possible one-fourth less than it now is, or about 48,000,000 gallons. If that water is then changed at the rate of 2,000,000 gallons a day, the whole will be renewed in twenty-four days, instead of, as at present proposed, in thirty-two days. The question is, whether, in the shallower water, the weeds would grow as rapidly in the shorter time, as they now do in the deeper water in the longer time. If the bottom of the lake were concrete, I think they would; if it were gravel, they would not. But, in all water, there is more or less of mud formed, and that would settle down amongst the gravel so that, in the course of a few years, there would be a black mass at the bottom which would require to be swept out. I think, therefore, it would be better to cover the surface with concrete, as in St. James's Park.

By Captain ARCHDALL: If there were no vent for the Ranelagh Sewer into the Serpentine, the fœcal matter, in case of overflow, would get into the houses, so that, for the present, it is not possible to prevent that nuisance. The depth of the sewer proposed to be constructed in Hyde Park will be forty feet in some places, and not more than 100 yards from the Serpentine. I think there is no fear of its drawing the water from the lake, because it will be constructed in the compact London clay.

By Lord J. MANNERS: The reservoirs at Nottingham, to which I have referred, had shelving banks, and both they and the bottom were gravelled. I think, in the case of the Serpentine, a concrete bottom would be best, as there is a danger of the loose gravel in places sinking into the mud. If the mud were removed, I think it would be immaterial which, but I should prefer the gravel.

By Sir M. RIDLEY: Pitching would make an excellent bottom, but it would be more expensive. The overflow-water from the Serpentine would be quite useless for the supply of St. James's Park, even if the bottom were covered with asphalte.

By the CHAIRMAN: The water from Duck Island would be quite equal to the water supplied from my filters, at the moment it first came from the well; but the combined effect of light and heat would soon deteriorate it, because of the large quantity of organic matter and salts contained in it. It is, in these respects, four times as impure as the water in the Serpentine.

Joseph Quick, Esq., examined by the CHAIRMAN.

I am a civil and consulting engineer, and am connected with the Grand Junction and Southwark and Vauxhall Water Companies. I have had had great experience as to the manner and results of filtration. Except in the summer months, we have not much aquatic vegetation in the water in our reservoirs. The system adopted by us is to pass the water into subsiding reservoirs, and thence into filtering-beds, where all matters held in suspension in the water are removed. Our filter-beds will last sometimes two or three weeks without being cleansed, sometimes only as many days, depending upon the state of the atmosphere. When the beds become choked up rapidly, it is entirely from the accumulation in them of vegetable matters. The 32nd part of an inch in thickness will choke up the bed, owing to the denseness of the vegetation. To clean the filter, the water is drawn off, and a layer of sand from a half to three-fourths of an inch in thickness is removed. The sand is then washed and used again. The waste of water in this operation is from 300 to 500 gallons per cubic yard, depending upon the amount of vegetation which has accumulated in the sand. This water passes off with the green matter which it has removed into the drains or sewers. If it is exposed to the action of air and light, the green matter becomes very offensive in the course of two or three days. We, therefore, endeavour to get rid of it as quickly as possible. The cost of cleansing the filter-beds is £150 a year, or 1-10th of a penny for every 100 gallons of water purified by them. We allow half an acre of surface for each million gallons of water per day passed through them. The depth of water in them is from 2 feet to 2 feet 6 inches. Our supply is drawn from the Thames at Teddington Lock.

By Sir J. SHELLEY: It would depend upon the medium of filtration employed, whether the beds proposed by Mr. Hawksley are large enough for purifying the proposed quantity of water daily from the Serpentine. If the medium is a coarse one, it would be. When the sand is clean, about 50 gallons of water per superficial foot will pass. If too great force is applied, it will drive the sand down, and consolidate it, stopping the operation of the filter altogether. I do not think that, by Mr. Hawksley's process, the water would be so bright, nor anything approaching to it, as the company's water. If a less space than an acre for each 2,000,000 gallons of water purified daily is taken, then a coarser medium must be employed. The slower the filtration is carried on, the more perfect will be the result. I think it would be necessary to have catch cisterns, to intercept the vegetable matter removed from the sand, so as to avoid choking the sewers. It would otherwise be necessary to flush the sewers, unless there was a great fall. In cleansing the water over and over again, a large amount of evaporation would take place; and if the overflow is to be maintained in hot weather, a supply of water from other sources must be obtained. I do not think the drainage from the park would be sufficient, except that occasional storms might make up for it. If 2,000,000 gallons of water were supplied by the company daily, at the ordinary rate, it would cost £50 a day; the expense of getting the same supply from Duck Island would be about £5. If the Serpentine were completely emptied, it would take a water company about ten days to refill it; and the cost, upon the present scale, would be £1750; to refill it from Duck Island, would take about thirty days, at a cost of about £175. I have not made any calculation as to the probable quantity which could be obtained from Duck Island. I do not think there is any reason to fear that, if the necessary quantity of water were withdrawn from the gravel in St. James's Park, there would be any danger as to the foundation of the houses in the vicinity.

By the CHAIRMAN: The bottoms of our reservoirs are paved with brick, which is found to be the most advantageous, as they are easily cleaned.

FRIDAY, MARCH 9.

Charles Greaves, Esq., examined by the CHAIRMAN.

I am the engineer to the East London Water-Works. From my experience, I think there is no question that filtration through sand is an effectual method of getting rid of any floating weeds in water; but there are inconveniences attending such filtration. The principal difficulty, I think, is the removal of the mud after it has been deposited on the sand. So far as my experience goes, I think filter-beds choke up more quickly from vegetation than mud. It would be difficult to tell the gross difference between the obstruction from mud and vegetation, because a great deal depends upon the season. Last year, the filter-beds were choked very rapidly; there was hardly ever known such a year. The water of the East London company contains a considerable quantity of this vegetable matter, and I am not aware of any river or lake in which this does not exist to some extent. Vegetation commences in the spring of the year, and according to the season will depend the vitality. Where there is a great deal of sewerage, it acts as manure to it. Where the water is stagnant, and sewerage runs into it, I should say that weeds would grow at a much greater rate than in the Thames above the tidal

area; but I have not had much experience on such a question. I do not imagine it would be difficult to filter the water in the Thames, but I do not think much result would be produced. If a thirtieth part of the water of the Serpentine were filtered daily, the whole lake would not be much affected by it. It would depend very much upon the season, but still the chances would be very much against the rendering of the whole lake clear. It is possible that the opacity of the water might be diminished; but, if at the commencement of filtration the vitality were equal to that of last year, the water would run into life very quickly, and the vitality would overtake the filtration. My opinion is, that a thirtieth part of the whole bulk would not be sufficient to heat the vitality, but I should not like to be too confident about it. Taking the average run of seasons, I think that quantity being filtered daily would add to the clearness of the water. I decidedly imply by that, that you could not make it quite clear. The commencement of vitality in the water is generally in April, sometimes in May, and occasionally as early as March; after a hot day or a hot night, it grows very rapidly. It begins at the top and goes down to the bottom; when it adheres to the filter-beds, it has to be removed by mechanical force. I have had filter-beds choked up in three days, principally from vegetable growth and mud in the middle of the summer. After August, the vegetation goes off; but, in the four preceding months, the filter-beds get choked very suddenly. The area of the filter-beds of the East London Water-Works Company is twelve acres, and the amount of water supplied last year was 17,000,000 gallons daily. The area of the filter-beds is divided into thirteen portions, and we travel round seriatim. The 17,000,000 gallons are filtered within the twenty-four hours. The beds were choked up last year, on an average, every three weeks. We have 1½ acre constantly being cleansed; leaving 10½ acres always efficient. When we are put to the push we can, with twenty-four or twenty-five men, clean an acre of the filter-beds in a day. The process of cleaning a filter-bed is usually this. When the bed is choked up so that no more water will pass through, the water is drawn off; and, as soon as the surface is in a condition to walk upon, the men go in and scrape the weeds and other matter into heaps, and these heaps are carried away with barrows. The next process is that of washing the sand, which is put into a cistern with a false bottom, into which a pressure of water is introduced by means of the steam-engine, when the whole matter has been well agitated; it then falls on to a wire grating, the mud slides down, and the clean sand falls through on to the floor beneath, and it is then taken away ready to be used again. The mud, water, and vegetable matter are got rid of through any channel that may present itself. The bulk of water used is considerable—about 2000 gallons to a cubic yard of sand. It might, perhaps, be done by using less water, by doing away with the flowing, which is part of the process I have described. There is another mode of washing the sand, which does not employ the power of the engine. That is to have a sloping trough, into which the water may be admitted. It must be of certain length, to give the water a sufficient impetus to knock the sand about; and, by the time it reached the foot of the incline, it would be clean. There is then a grating, through which clean sand falls on the floor beneath. The cost of cleaning the filter-beds, through the whole of last year, which is a good year, perhaps, to choose, was £10 per acre. That includes the washing, re-sanding, and all the accessories incident upon keeping a place, at the end of the year, as good as when we started. I think that amount may be divided in this way—£4 for scraping, £4 for washing and re-sanding, and £2 for new sand, materials, foreman's wages, and incidentals. I have included nothing for water in the £10. If we were purchasers, instead of sellers, I should have to add the price of water. Another mode is to reckon £135 per annum for 1,000,000 gallons a day. In that calculation, I have allowed nothing for the interest on plant. We use fine sand on our filter-beds. Coarser sand might be used, if the water were not for drinking purposes; but it would be difficult to say whether it would be advisable to do so. If the coarser sand were adopted, the mud might penetrate into it, and the labour required to remove it would be enormous. The depth of the filtering medium is 3 feet 6 inches, and my plan is to keep about that depth of water upon it. I do not think the matter arrested in filtration is of a character likely to obstruct and stop a sewer, unless some folly were perpetrated. When the confervæ is in a condition to be rolled up, we do not throw that into the sewer; we bury it. It may sometimes be rolled up almost as large as a waggon; it becomes very dense when it is subjected to a large pressure of water. I do not think that, if these vegetable filaments are exposed to the light for a period of twenty-four hours, they would decay, and produce a disagreeable odour. I think the naked weed would stink on the third day. I have never found a very disagreeable smell arising from the filter-beds. There is a little odour from the sand while it is drying—a sort of sea-side smell, but nothing obnoxious. When heaps of muddy sand that have been scraped up are cut into, there is sometimes a bad smell. That smell only arises after we cut into the interior of the heap. A heap may stand occasionally for a month. There are not many habitations in the vicinity of the East London Water-Works.

By Lord FERMOY: The £135 per annum for 1,000,000 gallons does not include superintendence of the company nor the interest on plant. If the water were pretty good, you might get 2,000,000 gallons through an acre per day, but I think an acre would be rather sparing, and I should not like to undertake to do it. With reference to the question asked by the Chairman about those green blankets or filaments, which are rolled off the beds, I think it would be easier for a man to take them away, than to force them into a sewer. Of course, it would depend upon the proximity of the sewer, but under ordinary circumstances it would be much easier to bury them, because the man could not force them into the sewer without a great deal of trouble. We have never received any complaint from the parties in the neighbourhood, where this green vegetable matter is buried. I do not think the vegetable matter is much good as manure. We take it to our own gardens; simply because it is necessary to have a place to put it.

By Sir M. PETO: I have not compared the water of the Serpentine with that of St. James's Park. The vegetation commences on the top of the water and gradually descends. The East London Water Works Company take their water from the river Lea. I do not think there is much difference as regards the vegetable life of water in a quiescent state, and water in a river. We have great quantities of mud to contend with occasionally. The matter arrested in a filter-bed filtering two million gallons per day would not be likely to choke a sewer, but of course it would add to its duties. The filtration of a thirtieth part of the Serpentine would tend to clean it, but I cannot say exactly to what extent.

By Sir J. SHELLEY: The filter-beds are more easily choked up from weeds than if weeds and mud were mixed together. It is decidedly more difficult to get rid of the weeds in the summer months than at any other period. I think the water coming from the filter-beds, being more bright and permeable to the sun, would be more likely to be filled with weeds than if the water were in a medium condition. I am of opinion that the proposed filtration would not produce clear water on such a lake as the Serpentine. If coarse sand is used in the filter-beds, much more labour would be required In Mr. Hawkesley's scheme, you would have the evaporation of the additional area of the fountains and filtering-beds; and, from filtering over and over again the same water, there must be some extra supply to make up for the evaporation and waste. I am not acquainted with the springs in the Serpentine. I do not imagine you would get much from under-drainage. Our Parliamentary price—the wholesale price—is £25 per million gallons, which is the same as the Chelsea Water-Works Company. The filter-beds and engines being provided, the expense for filtering a million gallons per day would not be more than £135 per annum. It might be done for a little less; but it is rather difficult to state the exact amount, as I am unable to judge of the amount of weed you would have to filter out.

By Mr. LOCKE: The figures I have given to the committee exceed the account of Mr. Hawksley. His calculation amounts only to about two-thirds of mine. I think his amount for filtration is estimated at too low a cost. I do not know whether it is desirable to filter the Serpentine at all. I am not aware how long it is since it was cleaned out. If the water were drawn off, and the bottom properly cleaned, and covered with clay, or something of that kind, filtration would be unnecessary; but I think, if the bottom is not cleaned, it does not matter whether you have fresh water, or filter the present water; the effect will not be successful. I do not know much about the water in St. James's Park; but, when I passed over there, I thought it was very free from vegetable matter. A very large quantity of the water would have to be filtered every day, before you could succeed in changing its character. I think it would take about two years before the whole body were changed. I know that it is proposed to draw off 2,000,000 gallons a day at the bottom, and, after filtering it, to pour it in again; and that it is estimated to take thirty days to draw off the whole. My opinion is, that it would take a longer period than that, but I have not sufficient data to state the exact time. I am not prepared to give the committee an opinion as to the best method of cleansing the lake; but I should say, empty it, improve the bottom, and fill it again. That would not require any filtration for some time—say five years. I would then empty it again, clean the bottom, and fill it.

By Lord J. MANNERS: I am not acquainted with all the details of Mr. Hawksley's scheme, but I have some idea of what he proposes to do. (A plan was produced, and the witness pointed out that the water would flow down the north side of the lake.) The effect would be, that one side would be very much cleaner than the other. I know that quick-lime has a tendency to destroy the vegetable matter, but there would be some danger in mixing quick-lime with the filter-beds, inasmuch as it would be likely to obstruct their working.

By Sir J. SHELLEY: Supposing the bed of the Serpentine were treated as I have proposed, and 2,000,000 gallons of fresh water daily were poured into into it at the top, and allowed to flow over the waterfall, that would keep the lake clean for five or ten years, assuming the depth of the Serpentine to be ten feet. If the depth were reduced, the chances of keeping it pure would be reduced.

By Lord FERMOY: I believe that the mud in the Serpentine is injurious to the quality of the water; but I do not think that eight feet is any worse than one, for all below the surface is innocuous.

Mr. *T. Spencer*, examined by Sir J. SHELLEY.

I am a chemist, and have been employed by Mr. Hawksley to make an analysis of the Serpentine water. I reported to him upon it, and my report was given to the chief commissioner, and appears on the table of the House. On the 15th of July, 1859, I also made a brief examination of the samples of mud. The time given me to make the analysis of the mud was very short, and I stated to the best of my ability the result. I said that there was no danger to be apprehended from the mud, unless it was disturbed; I also said that the water was of a perfectly harmless character. I found the water perfectly free from taste; nor was I able to detect that smell which was so much spoken of, notwithstanding that I took a great deal of pains with it, because there was a very strong feeling on the subject. I found nothing in the water which is not to be found in other reservoirs. There was no danger to the public health to be apprehended from it at that time, assuming that the water was kept at the same level as when I made my report. I have made an analysis of the Duck Island water supply to Mr. James's Park. The sample I analyzed was taken the day before yesterday. I was requested to do so by Mr. James Easton. I was in the room when Dr. Odling gave his evidence of the contents of the Duck Island water, but it was not in consequence of his opinion that I made the analysis. I had obtained the results before that. I heard, in the course of the inquiry, that Dr. Odling had discovered eight grains of organic matter in the water of the Duck Island well, whereas my own analysis gave less than one. I felt there was something wrong somewhere, and I spoke to Dr. Odling with regard to it, previous to his giving his evidence. I stated to him my mode of procedure, and he said that it was the same as he had adopted. Since then, I have repeated my analysis, and I am confirmed in the opinion I have given of the analysis, and I am prepared to stand by it before this committee. Sample No. 1 was taken as it was pumped from the well into the trough. Sample No. 2 was taken a little way down the lake—about 160 yards—by the engine-house. Sample No. 1 will therefore represent the water from the well, and sample No. 2 will represent the water after being exposed to light and heat in the lake. The samples were taken by myself on Tuesday afternoon. The water, as it issued from the pump, appeared to be quite colourless, and without taste. After the well water stands a little while, it deposits some of its carbonates; so that you will find one sample differ a little from the other in that respect. (The witness then described to the committee the process of analyzation, the result of which was the discovery of about three-quarters of a grain of organic matter, whilst Dr. Odling discovered 8 grains.) I believe that 8 grains of organic matter could not exist in that water. There is a little iron in the water; but that could be produced by being pumped through an iron pipe. The portion of iron is very small indeed, and its presence tends slightly to purify the water. I consider that the Duck Island water, as regards organic matter, is not impure, but it would not be suited for domestic purposes, because it is too hard. I should not like to give an opinion as to which would be the most effectual in cleansing the Serpentine—2,000,000 gallons of filtered water, or the same quantity of fresh water from Duck Island. I think Mr. Hawksley's plan of filtration, under the circumstances, is a very good one. I have no doubt that if 2,00,000 gallons of water from Duck Island were poured into the Serpentine, and the same quantity were to be let out at the other end, it would render the Serpentine as clear as Mr. Hawksley's plan of filtration over and over again.

James Simpson, Esq., examined by the CHAIRMAN.

I am a civil engineer, and act for the London, Lambeth, and Chelsea Water Works. I have had great experience in water-works, particularly with regard to cleansing of water. I may say that I have been an extensive introducer of filtration. I have not, of late years, paid much attention to the Serpentine. There are other causes besides the floating and vegetable weeds which affect the quality of the water. The floating weeds, I may state are the principal cause, but the deterioration is very much aggravated by the flow of sewerage into the lake. It may occur only three times a year, but I have seen

it cause the water to flow six inches over the weir. I believe the lower part of the mud in the Serpentine has now become quiescent. If the sewerage were now diverted, that which is now in the lake, in the course of a few years, would become quiescent. The plan proposed by Mr. Hawksley for cleansing the lake from the impurities which are now found in the water, will be an improvement, but, as to its being effectual, I cannot speak positively. I should think a thirtieth part of the whole bulk filtered daily, is too little to add materially to the transparency of the water. The vegetable matter which you see floating about in the Serpentine could not be taken out by the use of nets. We have tried every means to remove such vegetation, but we have not succeeded; besides, there are weeds which grow at the bottom, which you cannot touch with nets. I cannot state the alternative that lies before the committee in cleaning such a piece of water as the Serpentine. I should certainly have great hesitation in reducing the depth of the lake, for I think that would add materially to its contamination. It would be quite impossible to lay down any law as to how the filtered water would pass down the lake, because it will be subject to atmospheric changes. The vegetable matter, after being exposed to the light and heat, gives off something of the same smell that one finds generally from ponds. It would be much better to bury the confervæ, &c., than to force it into the sewer; but the vegetable matter which Mr. Hawksley would get from his process would be comparatively small. I know that there have been no fish in the Serpentine since the lime was put in. That was a very wrong step, for I believe if the fish had been left in the water, it would be very much better than it is now. If there are twelve inches of mud in the Serpentine, that would have the effect of contaminating the water when there was a ground swell. I have seen the water in the Serpentine change very materially in a few days, and I do not know of anything that could produce that effect except the mud. The cost of filtration is £100 per annum per 1,000,000 gallons a day. That includes everything. The cleansing of the filter-beds, and the washing of the sand, would depend upon the water. There is no doubt that filter-beds get choked up much more rapidly during the summer months. In ordinary cases, during the summer months, they ought to be cleaned out about once a week. No disagreeable smell arises from that operation. The Chelsea Water-Works are in the neighbourhood of some very nice villas; and I have heard ladies express their approbation at the manner in which everything was carried on, and at the pains taken to prevent any smell. If any smell arose from the cleansing process, it would be the result of decided neglect on the part of those engaged in the works. If the depth of the lake is reduced, the chances of keeping the water pure would be much less. I think those who cannot swim, ought not to venture on the water. Great difficulty would attend the drawing off of the water from the Serpentine and cleaning the bottom. There must be large quantities of mud there, and I believe it would be twelve months, in a very fine season, before that could be all dry; and, in a wet season, it would take as long as two years. I examined the bed of St. James's lake whilst it was exposed. It was principally covered with black mud. I believe the mud from the Serpentine would be slower in drying, bulk for bulk, than that in St. James's park. If the mud were exposed for so long a time to the light and heat, I certainly should not like to walk round. If quick-lime were thrown upon it, it would greatly remove the deleterious effects. I should renew the quick-lime as often as a shower of rain came. I remember passing along St. James's Park one day, while the mud was exposed, and I was not very well for the two following days. When I make a bottom of concrete, I invariably cover it, because lime produces vegetation very rapidly. If the bed of the Serpentine were made of concrete, it should afterwards be covered with ballast, or something of that kind. I certainly prefer concrete, because it gives a sound bottom. I should not be satisfied with merely covering the mud with gravel and sand.

By Lord FERMOY: I have known the Serpentine for a great many years, and I never remember it being cleaned but once. I have noticed the water change colour in a very short space of time, especially above the bridge, where a considerable quantity of sewerage is deposited. It would not be any good to attempt to purify the lake, without first diverting the sewerage. Whatever you might do, I believe it would be a failure, because the sewerage, being of a fluid character, works its way down the lake, and, no doubt, is most injurious to the public health. It would be easy to draw off the water from the upper part of the lake, and clean the bottom, as compared with doing the whole; and it would be of much greater benefit to clean the upper part, and shut off the sewers, than to clean the lower part. There is no doubt that the mud at the bottom is, at times, very injurious to the water; but, if the sewerage were shut off, I believe the mud now there would become quiescent. To a certain extent the process of filtering, such as Mr. Hawksley proposes, would purify the Serpentine, and keep it pure. Irrespective of the cost, I should say that two million gallons of fresh water would be much more effectual in cleansing the Serpentine than the filtering process. Of course, it would depend a great deal upon the quality of the water. In 1856, the Chelsea Company supplied to the Serpentine 60,000,000 gallons, and it was complained of then. That was for the whole year; but the water was really supplied during the summer months. As regards the cost of supplying the Serpentine with water, the Chelsea Company have an unfortunate contract; they are obliged to supply the quantity needed at 2½d. per thousand gallons. The usual charge is 6d. per thousand gallons; and, assuming that the contract were to cease, that is what they would have to pay. It would necessarily cost less to remove the mud above the bridge than that which is below, because it is not so deep, In fine seasons, I think the bottom might be ready for concreting in twelve months. As regards the springs, there is a great misconception about them; I believe there is scarcely any water from that source. It would not be advisable to supply the Serpentine from Duck Island, for if a million and a half gallons were taken daily from there, the water would soon become much worse than it is now, as it can only come from a polluted district.

MONDAY, MARCH 12.

James Simpson, Esq., recalled, and examined by Sir J. PAXTON.

The bottom of the Serpentine is very uneven, because there were formerly large gravel-pits there; but I am of opinion that, if the sluices were pulled up at the lower end, the water would run out to a considerable depth. If the mud were laid over the side of the Serpentine, it would take a long time to dry, because the gravel-pits were very deep, and there must be an immense quantity of mud in them. The mud has, no doubt, from time to time, flowed down the sewers, and filled up those holes. From some notes I have in my hand, I find that in 1842 the Serpentine flowed over the Bayswater Weir, from eleven o'clock of the 16th of January, till twelve o'clock at noon on the 18th. The storm on the 2nd of August, 1846, to which I have alluded, caused the water to flow 6½ inches over the weir. It is very difficult to say what would be the best plan to adopt with regard to the bottom. I know there is an impression that there is a good deal of water from the springs; but, as I said before, I do not think that is the case. I am afraid the upper part of the Serpentine could not be levelled for what might be called a moderate expense. I remember, on two occasions, a great quantity of black soil being taken out of the Serpentine. There were about 10,000 yards taken out at one time, and 5000 yards at another. After it was taken out, it was spread on the grass to dry. It would cost 5s. a yard to remove the mud, and it makes very poor ballast when it is dried. If it were removed on to the shore, probably it would not take longer than six or eight months. There would not be much difficulty in flooding it into the Thames. With a good pressure of water, you might remove it at the rate of 10,000 yards a day. I believe it would be the cheapest way to flood it all into the Thames.

By Mr. BLACKBURN: There is no question that a great deal of the water was cut off by the drain in the Edgeware Road, and in the Bishop's Estate, and by the sewers; so that the area for the collection of water in Hyde Park is reduced to that which is within the railings.

By Mr. BEACH: I do not consider any system would be effectual that proposes only to deal with the water, without reference to the mud at the bottom, unless some fresh water were put in. For many years, the Serpentine has not been self-supporting. Before it was supplied by the Chelsea Water-Works Company, it had gone down to a depth of about 46 inches.

By Mr. LOCKE: That reduction was partly due to the water being let off at the end of the park. It might be from an accidental circumstance, but still it continued so long, that I think there is very little doubt that it was mainly owing to absorption and evaporation. In 1850 and 1851, there was very little water went up to the weir. If there had not been a supply from some other source at that time, the water would have gone down very much. Supposing that I were asked by the committee to supply that deficiency, if the water companies would not supply it at such a rate as might be considered reasonable, I should look to the surrounding stream, and probably consider whether it might be obtained from a well. Deep well-water, I think, would not be likely to keep very well in the lake, because we generally find that deep well-water contaminates very quickly. A deep well would be one mode of supplying the Serpentine, although it is quite possible that the water from the ordinary well system would prove more effectual. If you pump from Duck Island, I believe you would spoil the water that is now good; for, as I have already said, if you carry pumping to a great extent, you will have a supply of nothing but bad water. The only system that I could recommend, to do away with filtration, would be to have river-water. If I had river-water, I should not filter it, because, when filtered, it becomes impure much more quickly. Setting aside the question of expense, I think it would be a good plan to take the water from the Hampton-Court branch of the Colne, about 15 miles distant. You have an example of what the water is there; it is generally kept in a good state. In 1850, our company supplied to the Serpentine 99,000,000 gallons; in 1851, 72,000,000; in 1852, 72,000,000; in 1853, 51,000,000; in 1854, 58,000,000; in 1855, 48,000,000; in 1856, 60,000,000; in 1857, 42,000,000; in 1858, 41,000,000; in 1859, 38,000,000; in 1860, up to the 1st of March, 20,000,000. Looking at the expense which has already been incurred in preparing filter-beds to carry out the system recommended by Parliament last year, I would not advise this committee to abandon that system, and resort to any other. My strong recommendation would be to go on with it. There may be some little difficulties; but I do not know why it should not succeed. I should see no objection to putting gravel to the depth of a couple of feet on the mud in the bottom of the Serpentine, if you could prevent the gravel sinking down. I think a good plan would be to put hurdles over the gravel-pits; then, brushwood; after that, a layer of clay, which would prevent the gravel from sinking through. If this system were adopted, you would do away with the fearful operation of drying the mud in the atmosphere. I think, if you were to put the gravel on to the mud, without anything, it would go to the bottom. If this system of filtration were carried out, and the mud in the upper portion of the lake taken out, and the bottom levelled, I think that would get rid of the major difficulties of the Serpentine.

By Sir M. PETO: My opinion is, that the great evil arises from the sewer at the upper end. You might as well do nothing, if you do not shut up the sewers; for, if you were to pour in 50,000 gallons of water a minute, it would contaminate the whole. I have had some experience in water drawn from shallow wells. Such water generally contains a large amount of salt and carbonate of lime, and is very favourable to the growth of vegetable matter, *confervæ*, &c. I believe that, if 2,000,000 gallons of water per diem were pumped out of the Duck Island well, the water would be prevented from percolating through the strata, and the houses in Westminster would be injured, and you would in a short time get nothing but sewerage water. If it were proved that that quantity has been pumped out, and the water is not in a sewerage state, that would shake my opinion; but I am quite sure that quantity has never been pumped. I judge from the very small engine there. It must be a very different engine from any that I ever had, if it could pump 2,000,000 gallons of water a day. The well that I spoke of the other day, which was sunk to the depth of 18 feet, and in which we got such bad water, was for Messrs. Thorne, the brewers.

By Sir M. W. RIDLEY: When the Duck Island well was sunk, I believe the pumps in George Street and the neighbouring vicinity were all drained. I do not know that the pumps above St. James's Park were affected, but I should imagine that they were, because I know that the sand and gravel strata extend to St. James's Palace, Pall Mall, Charing Cross, and Regent Street.

By Sir M. PETO: When the Victoria Docks were constructed, although the well was much nearer to the Thames than that of Duck Island, all the land round about was drained without getting any water from the Thames.

By Captain ARCHDALL: Even if you could have the requisite quantity of water from Duck Island, as good as it is now, I believe it would be much better to have it from the river. At the upper part of the Serpentine, there is no gravel; there you get the clay. The gravel-pits that I have alluded to are below the bridge.

Mr. *Easton*, examined by Sir J. SHELLEY.

I am a civil engineer and a partner in the firm of Easton and Amos. I have been consulted as engineer upon various water-works throughout the country—at Brighton, Torquay, Taunton, and a great many other places. Our firm is at this moment supplying with water all the public offices in London, as well as the House of Commons. We supply the House under a contract, which commenced in 1848. I was consulted with reference to the water supply in the Serpentine, in June, 1848, by the Commissioners of Woods and Forests. My attention was then specially directed to the Serpentine, and I know that great difficulties have been experienced for some years past in the water supply. The first report I made to the Commissioners of Woods and Forests, in 1848, had reference to the mud only. I stated, in my report of the 1st of December, 1848, that the quantity of mud and soft clay in the Serpentine amounted to 166,877 cubic yards, and to remove it with safety to the public health would cost from 3s. to 3s. 6d. a yard. I reported on the 4th of December, 1848, that I had given the subject of improving the water in the Serpentine much consideration, and recommended what, in my opinion, should be done. The depth of the water at the Kensington

Garden end being only from 1 to 2 feet, I proposed to make it 3 feet 6 inches, and reduce the depth of water in the lower end, next the cascade. According to my scheme, bathing would be rendered perfectly safe for children, as well as grown-up persons, because there would be a width of from 90 to 100 feet, on either side, that would not exceed a depth of 5 feet in water. The total contents, after being thus formed, would be about 57,122,000 gallons, which I proposed delivering from the Government Water-Works in Orange Street. I estimated the total cost of this work at £28,000. I have gone over that estimate again, and from what I saw, I think it would have to be increased about £2000; so that the whole could be done for £30,000. In a communication to the Chief Commissioner of Works, in 1857, I stated that the water from Duck Island would be sufficient to supply and keep clean not only the lake in St. James's Park, but that in Buckingham Gardens and the Serpentine. The steam-engine, pumps, and pipes, to accomplish this, I estimated at £7500. The annual cost, after everything was ready, for supplying a sufficient quantity of water for keeping all the lakes in a pure state, I estimated at £740. In our tender to Lord John Manners, which was declined, we proposed to supply the Serpentine from Duck Island; and the cost of the steam-engine, pipes, &c., for feeding the lake in Buckingham Gardens, the Serpentine, and the piece of water in front of Kensington Palace, we calculated at £5850. We stated that when the Serpentine had been cleaned out, and made like the lake in St. James's Park, we could keep the whole supplied for £500. In order to supply the Serpentine from Duck Island, I should elongate the tunnels in the well. To pour 1,000,000 gallons a day into the Serpentine, in connexion with the other lakes, would cost about £115. I do not think 2,000,000 gallons would be required. I could deliver 1,750,000 gallons a day of water to the Serpentine, for £150, if I was allowed to stop the engine when no water was required. I saw the late Mr. Fitzroy on the 26th of August, 1859. That was before anything was commenced with reference to Mr. Hawksley's scheme, but after the vote had been taken. Observing in the *Times*, of August last, that the plan of emptying and levelling the bed of the Serpentine had been relinquished, and that the proposition had been made to filter the water in the lake, at the rate of 2,000,000 gallons a day, we wrote to the late Chief Commissioner, offering to provide and fix the necessary machinery and pipes, and to deliver 2,000,000 gallons of fresh water per day into the upper end of the Serpentine, during the summer, and 1,000,000 gallons during the winter, for £13,000. We also guaranteed that the annual expenditure should not exceed £900. That offer was not accepted. The quality of the water in Duck Island I believe to be very good. We proposed to pour a given quantity of water into the upper portion of the lake, and let it flow out at the other end. If that scheme were carried out, I believe it would be more popular to the vulgar mind than filtering the water over and over again. The water at present is pumped from Duck Island by a small agricultural engine. If the Serpentine were supplied from that source, it would be necessary to have another engine, of about 8 or 10 horse power. Supposing that 2,000,000 gallons per diem were pumped from the Duck Island well, I do not think it would at all affect the houses in Westminster. Here are samples of the strata [producing them]. Since we have made this well, there has been no settlement, and I do not think there is likely to be any, if even this quantity of water were pumped out.

By Lord Fermoy: By pumping our present quantity which is about 500,000 or 600,000 gallons a day, the water in the well has sunk about seven feet. I believe, to supply the Serpentine, it would not sink more than an extra 4 feet. If it sank more than that, I should elongate the tunnels, and get the water in more quickly. I am quite confident that Duck Island will furnish a sufficient quantity of water for the Serpentine, and we are quite willing to abide by the letters we have sent to the commissioners, and take all the responsibility. The water in Buckingham Gardens is taken from Orange Street. We have £450 a year for supplying those gardens and St. James's Park, and we could pour 1,000,000 gallons into the Serpentine for an extra £150. We should be able to do it much cheaper by doing the lot. Of course, if we had to supply the Serpentine separately with 1,000,000 gallons, it would cost much more than £150. I consider that the Thames would supply a large portion of the water necessary for the Serpentine; we should drive the tunnels in that direction. I do not think that the sewerage water passing between the well and the Thames would be drawn to the well, because the sewers are made of bricks and cemented, rendering them watertight. I have had the water analyzed, and found no organic matter in it. After I heard the evidence given by Dr. Odling of the enormous quantity of sewerage water, I went to Mr. Spencer directly and said "I want you to analyze this water, because if what has been stated is a fact, I shall give up the whole scheme at once. The water for my analyses was taken when the well was pumped to the level of the sewers in the neighbourhood. We took the sample about half past 4 o'clock in the afternoon after pumping all day.

By Sir J. Paxton: I should not adopt the plan of filtration while I could get water from another source. I do not think in this instance it would be a good plan to take the water from the Colne, it would be too expensive.

By Mr. Blackburn: When we sunk the well, after pumping at the rate of 2,000,000 gallons a day, we did not exhaust the supply, although we reduced the water to the bottom.

By Mr. Blackburn: I am distinctly of opinion that the water in the Duck Island well is Thames water filtered through the gravel. I think 1,000,000 a day would be quite sufficient for the Serpentine. 2,000,000 gallons would cost 40s. a night extra. The peat in the neighbourhood of Duck Island is of a peculiar character, not at all of a spongy nature.

By Sir F. Smith: If the sewer at the head of the Serpentine were cut off, it would still be necessary to do something at the public expense, because the mud would contaminate the water; and it would be necessary to cover it over in some manner.

By Mr. Locke: The St. James's lake contains about 12,000,000 gallons of water. It has been twice cleaned out since it was filled.

Wednesday, March 14.

Mr. *Easton*, recalled.

Examined by Sir J. Shelley: It would take 372 hours pumping, at the rate of 583 gallons per minute, to fill the St. James's lake. I do not think the adoption of fresh water into the Serpentine indispensable. I do not anticipate any evil consequences to buildings in the neighbourhood, if we were to pump the whole of the water in Duck Island well. My statement is, that we disturb none of the material of the ground. As a proof of that, after pumping seven or eight days and nights, as I stated yesterday, we had only a barrow full of gravel. My opinion is, in fact, that so long as the water only is taken, and none of the gravel is allowed to move, nothing can occur to the foundations. I have had no complaints in the neighbourhood where I have been pumping. I said the other day that I would at once give up the scheme, if the analysis given by Dr. Odling was correct, which I did not believe it to be. I am of that opinion now, and I am confirmed in my opinion by the statements of Mr. Warrington and Dr. Franklin. I have had the water analyzed by them, and their opinion is that the water is very pure and free from any noxious ingredient. I agree with Mr. Simpson that the natural springs flowing into the Serpentine are almost entirely cut off, and that they have very little effect upon the whole supply. I believe we shall want about a million of gallons a day to supply the Serpentine and keep it clear. By Mr. Hawksley's scheme, there must be, as I have said, an increase of evaporation, and that must be supplied in some shape or other. The average quantity supplied by the Chelsea Water-Works has been, for the last ten years, 56,000,000 of gallons. If this scheme be carried out, that quantity will have to be supplied from some source or other, if not from Duck Island well, from Chelsea or other water-works. I should think Mr. Simpson was correct in saying that a supply of 500,000 gallons a day, for 150 days in a year, would keep the Serpentine up to the present level—which amounts to 75,000,000 of gallons annually. As regards the comparative expense of the two plans, I believe there will be a considerable saving from the adoption of my plan. When the works at Duck Island were put up, it was intended to extend the supply from that source to the Serpentine and Buckingham Gardens, and to erect permanent works for that purpose. Until that was done, I was asked by the Government to lend them the requisite machinery for supplying St. James's Park from Duck Island well, and to continue the temporary supply to Buckingham Gardens from the Orange Street works. I was paid for that £450, including the hire of the machinery. Supposing it were determined not to supply the Serpentine from Duck Island, it would be necessary that works should be erected to render the supply to St. James's Park and Buckingham Gardens permanent. At present, there is only an agricultural machine, which can only be looked upon as temporary. The cost, including machinery, pipes, and buildings, would be about £2500. Supposing the plan which I suggest to be adopted, the works I propose to erect for the supply of the Serpentine would amount to £8000; and would include in one establishment the supply of the water to St. James's Park, Buckingham Gardens, and the Serpentine. If it were desired to arrive at the amount chargeable to the account of the supply of the Serpentine, the cost of the permanent works for the supply of St. James's Park and Buckingham Gardens will have to be taken into account. The contract with the Chelsea Water-Works determines at the end of two years. I propose for this £8000, and an annual expense of £600, to supply daily to the three lakes the following quantity of water—to the Serpentine, 1,000,000 gallons; St. James's Park, 320,000 gallons; to Buckingham Gardens, 80,000 gallons. The cost of supplying the two latter places would be, as I said before, £2500; and the annual expense of these two supplies would be £250. The expense, therefore, to the country of supplying the Serpentine alone would be £5500. The cost of the present temporary supply to St. James's Park and Buckingham Gardens is £450 per annum. I estimate the annual expenditure for the supply of the three lakes, if my scheme is carried out, will be £600; and, deducting the expense of the supply to St. James's Park and Buckingham Gardens, the sum chargeable to the Serpentine itself would be £350 per annum. By Mr. Hawksley's plan, the cost of pumping and filtering would be £300 per annum. The cost of the supply to the Serpentine by the Chelsea Water Company, until the expiration of the contract in 1862, is £515. 12s. 6d. After that time, the cost of water, from either the Chelsea or Grand Junction Water Company, would be 6d. per 1000 gallons; and the cost would be consequently increased to £1400. By my own plan, the annual cost of the Serpentine supply separately would be £350; but, if it is considered preferable to charge the whole first outlay to the Serpentine, and to consider the supply to the other two lakes as an incidental advantage, the annual cost would only be £150. According to Mr. Hawksley's scheme, the annual cost of the Serpentine supply, until 1862, would be £815. 12s. 6d.; and, after that time, £1700. There would, consequently, be a saving of £465. 12s. 6d. for the next two years; and of £1350 per annum after 1862, or 25 per cent. per annum upon the outlay, by the adoption of my plan as compared with Mr. Hawksley's.

By the Chairman: I do not believe that the gravel-bed, from which we now draw the water, is impregnated with gas. I have heard of the condition of the well sunk in connexion with Mr. Thorne's brewery, but that was many years ago, and the circumstances are very different from any that now exist. Mr. Simpson stated in his evidence that the minimum amount supplied to the Serpentine was 18,000,000 gallons a year, and the maximum 35,000,000; so that the annual supply to the Serpentine alone would be 26,000,000, and not 56,000,000 as I have stated; and I should have to reduce the sum considerably. The £1700 would be reduced to £900.

By Mr. Egerton: The water pumped up at Duck Island all comes out of the gravel. I do not believe that any comes out of the peat.

By the Chairman: At the time the lake was stopped up, I heard of wells in the neighbourhood being dried up. There has been no complaint in that way since we let the water out after the completion of the adits. The springs in the Serpentine might be recovered if the overlying mud were removed according to Mr. Page's suggestion.

By Mr. Walter: I think it would be better to prevent skating altogether in unsafe places. I believe it has been stated by Mr. Hawksley that the growth of vegetable matter in water is the means provided by nature for the purification of water, but it depends upon other circumstances. The reduction of the volume of water renders it more likely to become impure. Light has a considerable effect in promoting the growth of vegetable matter. I do not, however, think it would be materially diminished if the bottom were paved with some dark substance; I do not think that would prevent it.

By Mr. Locke: No inconvenience has arisen that I am aware of to the houses in Westminster from the pumping in Duck Island. I entirely differ from Mr. Simpson in attributing any settlement of the houses in the neighbourhood of Queen Street to that pumping. The lake was first filled from Duck Island in 1857, and was emptied in November, 1858, in order that it might be cleansed. I have had great experience in the filtration of water, and I think Mr. Hawksley's filters would be quite insufficient for the filtration of 2,000,000 gallons of water daily, supposing the Serpentine to be made in depth the same as the lake in St. James's Park.

By Sir M. Peto: There may have been inconvenience found in the lowering of wells in the neighbourhood of Broadway and Carlton Gardens when the pumping at Duck Island was commenced. If we draw the water from those wells, we must go nearer the Thames. I believe in the existence of a communication between the Thames and Duck Island well, because at very high tide the depth of water increases in the well. If it were proved that many old sewers in Westminster went down into the gravel, I should not think that the effect now produced upon my well might be attributed to that cause. If the sewers went into the gravel, they might be pumped, but I dispute the fact of their going into the gravel. Of course, if there are sewers between the Duck Island well and the Thames, constructed of a percolating medium, their contents must find their way into my well before I could get at the Thames water.

By Sir J. Shelley: I originally proposed to supply to the Serpentine, 600,000 gallons a day. I considered that that would be better than the filtration proposed by Mr. Hawkesley, when the lake was made shallow. Mr. Locke ought to have added in his comparison of the two schemes, to the annual cost of Mr. Hawkesley's scheme, the interest on the expenditure for

works. I think the building of the Westminster Hotel was begun the year after the works in St. James's Park were finished; therefore, the settlement which Mr. Simpson spoke of as having taken place there, cannot be attributed to my works.

Mr. LOCKE: Mr. Simpson said the settlement of the two houses in Queen Street was produced by the pumping which took place in refilling the lake. With regard to the Westminster Hotel, he recommended that the peat should be removed until the gravel was reached, so as to obviate accidents.

Witness: That may show that peat upon gravel is liable to have the water taken away; but I think the people in Westminster may rest safely in their beds, without the slightest apprehension of having their houses tumbling about their ears.

By Mr. WALTER: Pure water can be obtained by deepening the bed of the Serpentine, without having recourse to filtration or pumping.

By the CHAIRMAN: This particular water is not such as is used by brewers. It is a mineral water, and is too hard.

Dr. Hoffman's analysis of the water of the Serpentine was then read. It stated that that water contained 1·91 grains of organic matter against 2·5 grains, in the case of the Duck Island well; and 22·17 grains of mineral matter against 74·4.

Mr. *Edward Easton*, examined by the CHAIRMAN.

I have taken steps with reference to gauging the supply of water coming from the wells. I commenced yesterday morning. It has been continued from 11 o'clock yesterday morning, to ½ past 8 this morning. At 5 minutes to 11 a.m., the water stood 17 feet below the surface. It went down gradually till 4 p.m. From that time until 10 o'clock, it stood at about 14, at 10·30 it had risen 8 inches, and at 8·31 this morning, it was 14 feet 5 inches. The spring gave out, on an average, 500 gallons per minute, or 720,000 in 24 hours. I did not perceive any difference in the quality of the water during that time, but I had no means of testing it. We have now another large engine fixed, so that we may be able to draw 1500 gallons a minute for 15 hours, and then take the gauging of the level during that time; and I shall be prepared on the next meeting to give the committee the results. The engine has been kept at its usual speed, and has thrown about 280,000 gallons short of a million. This engine could not have been made to go faster—it is one of the first agricultural engines made, and the power is not great. I think about a 10-horse power engine would be sufficient to have permanently to pump water into St. James's Lake.

By Sir M. PETO: I should not be surprised to hear that, when the works in connexion with the Victoria Docks were in progress, the water from gravel, to the extent of 100 acres, was pumped out, and that, as the pumping continued, one engine ceased altogether, and the remaining one only worked half time. I know other instances.

FRIDAY, MARCH 16.

Mr. *Easton*, jun., recalled and examined by the CHAIRMAN.

I wish to give the gaugings taken by us. We commenced last night to pump at half-past five, and we pumped till half-past nine, at the rate of 970 gallons a minute over the gauge-board, and at that time the water was 17 feet 6 inches from the surface. From half-past nine till two o'clock, we continued pumping, and pumped the same quantity without any variation in the depth. I then gave orders to drive the engines as hard as possible, and we pumped at the rate of 1,400 gallons a minute. At three o'clock, the water was down to 19·9 from the top of the well, and continued there until half-past four. We then got the steam still higher, and pumped at the rate of 1,460 gallons per minute; that is, about the rate of 2,100,000 gallons a day. The water was then lowered 6 inches more, at which it remained till half-past 5, when we left off pumping. At six o'clock, the water had risen two feet in the well, and the water at half-past eleven, when I measured it, stood 13 feet 6 inches from the surface after 6 hours rest. This result confirms my opinion as to the quantity of water that may be drawn from that well, and as contractors, we are still prepared to take the whole responsibility of those works being carried out, being paid nothing if they fail.

By Lord FERMOY: It is our opinion, after this experiment, that, if we were to pump 2,000,000 gallons a day, we should not bring the water any lower than that which it was this morning. It might vary a few inches, but that would be all. I cannot tell the committee what state the tide was while we were pumping, the last hour, at the rate of 1460 gallons a minute; neither can I tell you the state of the lake in St. James's Park, whilst this experiment was going on. We pumped 971,000 gallons in the 12 hours we were pumping.

Dr. *Odling* recalled and examined by the CHAIRMAN.

I have very little to alter with reference to my previous examination, with this one exception, I think I gave the result rather hastily to the committee last time, of 84 grains of residuum, in addition to the 8 grains of organic matter. Since then, I find from the analyses that it is 74·6 grains, and 6·7 grains of organic matter. I also find nitric acid and ammonia in great quantities; therefore, it is more objectionable than I thought on the last occasion. It is undoubtedly contaminated by the sewers. I infer that, from the ammonia and nitric acid—products of animal decomposition. I have sent samples of the water to Dr. Dundas Thompson, who found that it contained 5 grains of animal matter. I have sent samples to several other persons, who report that it contains nitric acid and ammonia. There would sometimes be a difference in the quantity of organic matter found in the same sample of water, when analyzed by different chemists, because the method is not quite an accurate one. The first sample I took on March 13, at eleven o'clock, just after they began pumping the water; and that sample contained 3·3 grains of organic matter. I took another sample at half-past one o'clock, the same day, in which I found nitric acid, and 5·1 grains of organic matter. This water was taken from the trough as it was delivered from the pump. The water did not appear to be discoloured to the eye. I may say it was perfectly bright. Since I gave my former evidence, in the samples that I have analyzed, the smallest quantity contained is 3·3 grains of organic matter; and the largest, 6·7 grains of organic matter.

By Lord FERMOY: I have sent samples of this water to several analyzers, and the results of their analysis correspond very nearly with my own. I know that Dr. Thompson has analyzed the water from several shallow wells in London, and the result of that analysis is, that the water in Duck Island is not worse than those wells. Perhaps rather better. I did not take the water at any other time during the day of the 13th, except at 11 and 1 o'clock, as I have stated It is my opinion that the organic matter and nitric acid would go on increasing if the well was pumped lower. I think the highest amount of organic matter that has been found in shallow wells is 15·9 grains. I think if the Duck Island well were pumped, it would produce water as highly deteriorated as that. Where Dr. Thompson found the 15·9 was in a well in Park Crescent, Regent's Park. That is a higher level than the Serpentine, I think, but I cannot speak positively. I cannot compare it with the tidal level of the Thames. There is such a difference in the Duck Island water from that of the Thames, that I do not think any water from the Thames gets into the well. I have found in the Thames water 2·3 grains of organic matter, and 21·3 grains of saline matter. If you were to keep on pumping the Duck Island well for some time, I think, as Mr. Simpson said, you would get nothing but sewerage water.

By Sir J. SHELLEY: I do not know the depth of the well in the Regent's Park. I am sure it is a shallow well, or it would not contain that amount of organic matter.

By Mr. WALTERS: I have not analyzed the Thames water taken from Westminster Bridge lately. I have taken water from the Thames at Greenwich, and have found nitric acid in it in very hot weather; but the same process which detected nitric acid in the Duck Island water, would not detect nitric acid in the water of the Thames.

Mr. *Page*, C.E., examined by the CHAIRMAN.

The question of cleansing the Serpentine was referred to me, in 1858, by Lord John Manners. My attention was called to the general question of making the Serpentine a fit place for recreation. I then made investigations, and found that there were about 180,000 cubic yards of mud, varying from 2 to 12 feet. I found very much more below the bridge. I found the mud in a very fluid state, which led me to suppose that there were springs in the Serpentine. I should prefer the removal of the mud to the covering of it over, because, otherwise you must drain from it those springs, which I thought ought to be brought into it. In St. James's Park, they have formed a drain for carrying off the spring water; but I should not like to do that in the Serpentine. The plan of covering the mud with hurdles, and leaving it in its present situation, would do very well so long as the hurdles remained sound; but, if they decayed, you would have the gravel going into the mud. I know that some such plan was adopted in carrying the Liverpool and Manchester Railway over Chatmoss; but that is not a similar case. I do not think that, if the water were drawn off about October, the mud would be dry enough to be covered over in the spring. If the mud were covered over, it would not do much mischief, providing the water were kept from it; but I am afraid from the water filtering through the gravel, it would have become soft, and the bed would settle down. After the water is drawn off, it would be much more easily seen what portions of the mud would be left, and what it would be necessary to remove. My original proposal was to collect the mud together, and form an island at the lower end of the Serpentine, which, if nicely planted, would form a screen for the bathers; but the objection to that proposition was, that it would give the Serpentine a contracted appearance, and destroy the broad expanse of water which now exists. My proposal is, that the lake should be 10 feet in the centre. I have no doubt the Serpentine could be put in proper order, including the widening of the road, for £30,000. I have not much apprehension about exposing the mud. I think if lime were thrown over it, there would not be much danger. If the part above the bridge were done first, the existing drains would be of some service. I do not think the placing of a dam at the bridge to keep back the water, would be a material consideration in the expense. I believe there is not much the matter with the water in the Serpentine now, but I have found it smell very badly in warm weather. I have in my hand a return of the number of bathers for the years 1844 to 1859 inclusive, and they amount to about a quarter of a million yearly. I think it is a monstrous thing that the sewer should still be allowed to discharge itself into the upper end of the lake. Instead of filtration, I should advise a fresh supply of water. I should think half a million gallons a day would be an abundant supply. The water supplied by the Chelsea Water-Works Company is poured into Kensington Gardens; it flows down into the Serpentine, and part of it is taken to water the roads. I do not consider the present supply is sufficient for the Serpentine. My suggestion is, to give three times the existing supply. I should prefer a quarter of a million rather than the plan of filtration. I think either the Thames water or well water would be satisfactory.

By Lord FERMOY: I believe that the bulk of the mud would be reduced about one-half, when it is dried. I know that 4lbs. of wet mud, when dried, only weighs 13 oz. I have not considered the possibility of burning the mud, but I think it is a plan worthy of consideration. No doubt, some of the springs would be cut off, if a deep sewer were made above and below the Serpentine. No doubt, you would cut off some of them, unless the sewer was water-tight. In my plan, I proposed to make the centre of the lake from 8 to 10 feet, and 2 feet at the sides. It would, no doubt, be safer for the bathers and skaters, if it were reduced; but I think it would require that depth to keep the water clear. If it were lessened, you must have a much larger supply of fresh water. I proposed the island, because I thought it would be the cheapest way of getting rid of the mud. Looking at the fact that there are a quarter of a million of bathers, in all possible states, I consider that filtering the water over and over again, without getting an extra supply, would not be satisfactory to the public, even though, in addition, some chemical substance were put in to purify the water. I heard Dr. Odling say that the water in Duck Island was considerably worse, in point of purity, than the water in the Thames. I am really staggered by the announcement. I do not say that the anylyses have not been carefully made, but I think sufficient samples have not been taken from the well at different times. Without throwing any imputation on the chemist or the engineer, I think there have not been enough of experiments to enable one to judge either of the quantity or the quality of the water. I do not say that the experiment of Messrs. Easton was useless, but I consider that the engines ought to be kept going about 96 hours during spring tides, and the same time during neap tides. I think the well is very likely to receive a supply from the Thames. I do not think it is likely, if you pump the Duck Island well at the rate of 2,000,000 gallons a day, that the sewerage that passes in the neighbourhood would go into the well.

By Mr. WALTERS: In dealing with the Serpentine, I think it desirable to ascertain the level of the bottom, before going into the question of water supply. Perhaps there would not be much objection to increasing the depth at the sides, and reducing it in the centre. The only thing is, if you have it as I proposed, any settlement is likely to find its way to the centre, and be carried away by the current. Supposing the plan were carried out above the bridge, I do not think it would give adequate accommodation for the skaters and bathers. I should certainly contemplate doing the whole.

By Sir J. PAXTON: I think the mud might be burnt. Of course, it would be a question of time. The gravel for the bottom could be got from the gravel-pits in the park. The most economical plan would be to do the whole of the Serpentine at once.

By Mr. LOCKE: We tried the mud in a great many places to ascertain its thickness. We found it soft in every place, which led me to suppose that there are springs in some places. I estimated the removal of the mud at a shilling a yard. I know that it has been stated that it will cost from 3s. 6d. to 5s. a yard; but I think that estimate is a great deal too much. I have never seen the water in the St. James's lake, since it was concreted in such a state, that it required to be cleared out; but I have no reason to disbelieve the "witnesses who state that it has been cleaned twice."

MONDAY, MARCH 19.

Mr. *Page* recalled, and examined by Mr. LOCKE.

The experiment of burning some of the mud from the bottom of the Serpentine has been tried at the receiving-house of the Humane Society, and the smell which it caused was very bad indeed. I am satisfied, from that experiment, that it would not be a desirable course to adopt. My original plan was, to put it into quarries as near as possible to the Serpentine, and, with the gravel taken from the quarries, to fill up the bed of the lake. I have given an estimate of £28,000 for the work, and have no doubt the estimate is sufficient, calculating that certain portions of dry material, to mix with the mud, would be brought in gratis.

By Sir M. PETO: If the bed of the Serpentine were laid dry, I do not see any objection to interlacing the bottom with faggots; and, assuming that that was done, and covered with gravel, I think it would be a satisfactory mode of dealing with it. In forming the island which I proposed, I should have made a concrete base all round, and filled it in with the mud.

By Captain ARCHDALL: It does not follow, because the smell from burning the mud would be offensive, that therefore it would be unwholesome. I have heard that, when the stench arising from the Thames last summer was at its height, the persons on board the hulk *Dreadnought*, lying off Greenwich, were in the best health during the whole of the time.

By Sir M. W. RIDLEY: I propose to remove the mud by carting. I should first take it away from the sides of the lake, and then lay down a tramroad for trucks. The mud might be removed by dredging; and a person of experience in such matters has informed me that it could be removed by that means for 1s. 6d. per cubic yard. But the bed of the Serpentine is very uneven, and you would have to dredge deep to get into the holes. Under any circumstances, I should think it necessary to let off the water before dealing with the mud. The mud could be washed out into the Thames at any tide, because it lies above the level in the river; but it would be liable to deposit on the banks. There would be less smell occasioned by the hand-dredging process than by burning; but, on economical grounds, I should not think it desirable.

By Sir J. SHELLEY: I am still of opinion that a quarter of a million gallons of water daily would be sufficient, and that it would be preferable to filtering 2,000,000 gallons. I understand that Messrs Easton and Amos propose to pump 1,000,000 gallons of fresh water daily from Duck Island well, and turn it into the basin in front of Kensington Palace, from whence it would flow into the Serpentine and over the waterfall into the sewer. They also propose to have always at hand a supply of water, which may be rendered available in case of a fire at the Government offices or any of the surrounding property. A portion of their proposition has also been carried out already—namely, the supply to the lake in St. James's Park; and, in addition, pipes to a certain extent have been laid down, with the view of an ultimate supply to the Serpentine. I believe they have made a tender offering to lay down all the works, and to bear the whole loss in case their plan proves a failure. I do not think that the pumping of the water from the gravel will endanger the safety of the houses in Westminster, unless, in pumping, the water, in being drawn to the well, carries the sand and gravel along with it. The foundations, however, may be affected by other causes. They are much more likely to be damaged by improperly constructed sewers. In the case of the Victoria sewer, the sand and gravel were drawn away, and the foundations of the houses were consequently rendered insecure. No doubt, if the water were abstracted from the peat above the gravel, a settlement might be produced.

By the CHAIRMAN: I have not made any experiments to ascertain whether, if the amount of water in the gravel basin be limited, and a great draw upon it causes the abstraction of the water from the peat above, the effect of preventing the gravel from moving would protect the houses from danger.

By Lord FERMOY: In order to ascertain whether sewerage water percolates into Duck Island well, I would have some small shafts sunk in various parts of the gravel in the neighbourhood of these sewers, which are expected to exude offensive matter. I would also try the effect of pumping at spring and neap tides, in order to ascertain whether water from the Thames finds its way into the bed of the river, and I think those experiments would satisfactorily establish the capacity of the well at Duck Island to supply the Serpentine. In the absence of such experiments, I should not think it prudent to found a large plan upon the basis that water might be procured at the rate of 1,000,000 gallons per day from this particular well.

By Mr. WALTER: I should be better able to give an opinion as to whether the plan of placing hurdles on the top, and forming a new gravel bottom above the hurdles, or the plan of removing the mud altogether would be the best, when I have had an opportunity of seeing the bottom drained. I think it would be of advantage to have some means of flushing the bed of the lake. At the present moment, the flushing process washes thousands of tons of solid matter into the Thames. Under any circumstances, the sewer at the upper end of the lake must be got rid of.

By Mr. BLACKBURN: It would be impossible to get rid of the deleterious qualities of the water by filtration; its clearness would be no criterion of its purity. If you could supply the water from the Thames above Teddington, I think that is all that would be necessary as to the impression upon the public mind.

By Lord JOHN MANNERS: There would be, practically, no difficulty in refilling the lake after the water had been drained off and the bed cleaned. Having heard the evidence taken before this committee, I am still of opinion that the plan I recommended last year is the best; but, having heard the evidence of Messrs. Easton and Amos, I reserve my opinion as to the source of supply.

John Fowler, Esq., examined by the CHAIRMAN.

I am a civil engineer, and at present engaged on the works of the Metropolitan Railway. Considerable excavations must be made in carrying out those works, and the gravel excavated might be rendered available in forming a new bed for the Serpentine. The point of the works nearest to the Serpentine from which the material could be carted is at a distance of 500 yards, and as the company will be at a great expense in carting away the gravel, unless it is disposed of otherwise, it could be obtained at a reasonable cost. I think it would be most suitable for a basis. There would be no objection to covering the mud in the Serpentine with hurdles, except on the score of expense. All things being equal, it would be better to remove the mud, but it would be a very large undertaking, and could not be done so cheaply as covering it over. With regard to the plans which have been suggested for supplying the Serpentine with water, I should prefer a supply of fresh water to the process of filtration recommended by Mr. Hawksley. At the same time, I should be sorry to limit myself to a fresh supply of 500,000 gallons daily, unless it was satisfactorily proved that that would be amply sufficient in conjunction with the natural supply. My experience in connexion with the works of the Metropolitan Railway, and also at the bridge at Pimlico, has shown me that there is a continuous flow of water in the gravel bed towards the Thames, but I cannot say whether that supply alone could be depended upon in the case of the Serpentine.

By Lord FERMOY: The works of the Metropolitan Railway are at present in progress, and are upon a higher level than the Serpentine. Good gravel is the best material you could obtain for the bottom of the Serpentine, but if you can get it from the banks of the lake itself, of course, as a measure of economy, it would be advisable to take it from that source in preference to the works of the railway, however reasonable their terms might be. I do not think that the filtration of 60,000,000 gallons of water at the rate of 2,000,000 per diem, would secure the filtration of the whole body of water every thirty days. I do not think you could wholly change the water in less than six or twelve months. Mr. Hawksley's plan is a very good one, under certain circumstances; but I am satisfied that he would prefer to have a clean bottom to begin with.

By Sir J. PAXTON: The water we have obtained is about as much in quantity as would run through a six-inch pipe with considerable velocity. In the summer, the bathers in the Serpentine are very numerous. If the bottom were cleaned and reduced in depth, the probability is, that the number of bathers would considerably increase. The gravel we are now excavating at the Metropolitan Railway Works is as fine a gravel as I have ever seen. At present, it is being taken by the Great Western Railway to Old Oak Common, about four miles out of London.

By Lord JOHN MANNERS: Of the two plans before the committee, I should recommend the adoption of the one which proposes to drain off the water in the Serpentine, remove the mud, lay down a clean bottom, and turn in a fresh supply at the rate of 500,000 gallons per day, to the other, which proposes to leave the lake in its present condition, and filter 2,000,000 gallons per day, of the water now existing.

By Mr. LOCKE: I should not adopt a concrete bottom on the ground of expense, and also because it would produce vegetation quite as rapidly. In any scheme it will be necessary to stop up the sewer which now finds its way into the upper end of the lake, and I do not think that the lake can be kept in a satisfactory state unless a constant supply of fresh water is passed through it. The present supply of fresh water is evidently insufficient, or the lake would never have got into the state in which it now is. I do not think the whole of the mud could be thoroughly dried in a month, but it might be drained, and the crust sufficiently dried to enable a gravel bottom to be formed above it. Mr. Page's plan of removing the mud into quarries, and filling up the bed with gravel would be a very expensive and unnecessary process.

By Captain ARCHDALL: From my experience of bogs in Ireland, I know that gravel may be placed on mud so as to bear a considerable weight.

By Sir J. SHELLEY: The gravel in which we have found water, in excavating for the Metropolitan Railway, is a portion of the same stratum as that under St. James's Park. If, in pumping the Duck Island well, you only abstract the water, without causing the sand or gravel to follow it, I do not think that the houses in Westminster will be endangered. When the Victoria sewer was constructed, the foundations of some of the houses in Westminster were rendered unsafe; but in that case the sand and gravel were drawn away. I do not think there is any reason to anticipate that the works at Duck Island will succeed in draining the peat above the gravel. There is nothing so tenacious of water as peat, and considerable difficulty is experienced in draining it. I think there is reasonable ground for believing that, if you abstract the water from the gravel, the vacuum would be filled by water percolating into it from the Thames.

Mr. *Herbert Williams*, examined by the CHAIRMAN.

I have, for the last seventeen years, been the superintendent employed by the Royal Humane Society at the Serpentine. At present, the water of the lake is not in an objectionable state, but the summer before last, it became so bad that it was found necessary to put lime into it, to purify it. No very marked smell has proceeded from the lake since the lime was used. It was placed in a flat-bottomed boat, and shovelled out as the boat was drawn along by other boats. A very large quantity was used. More smell arises from the water in the morning and evening than in the middle of the day; but I think that that arises from the bathers putting the vegetable matter in motion. Every time there is a heavy fall of rain, the sewer overflows, and the overflow consists of black slush, similar in appearance to that collected in the streets by the mud-carts. The appearance of the water of the Serpentine varies considerably; being more opaque in summer than winter. I estimate the annual number of bathers at nearly 270,000; frequently, in very hot weather, as many as 8000 and 10,000 persons bathe at once in the evening. During the last sixteen years, 32 persons have lost their lives from bathing in the Serpentine; 262 have been rescued, and landed uninjured; and there have been 111 bad cases, in which medical attendance was required. In some of these cases, the persons died after leaving the receiving-house, and going home. I believe that, in many cases, persons who have lost their lives would have been recovered, if it had not been for the effect the mud had upon them. If the safety of the bathers is to be consulted, the depth of the lake ought not to be more than seven or eight feet. A greater depth renders the process of dragging, when the life of a person is in jeopardy, most difficult. During the last sixteen years, there have been 95 suicides in the Serpentine; 152 persons have been rescued after immersion; and 45 have been prevented from going into the water at all. If the bottom of the lake were graduated in depth from the sides, many persons would be rescued who now lose their lives, inasmuch as persons who could not swim would be enabled to render assistance, while at present they are deterred from entering the water on account of the unequal depth. I remember a case in which a person who committed suicide by jumping from the bridge, remained in the water for six weeks, and when discovered, he was buried in the mud from his head to his knees; in another case, a person jumped from the bridge head first, and became fixed so tightly in the mud that he had to be twisted round by the drag like a corkscrew before he could be got out. During 16 years, about 1,268,000 skaters have visited the Serpentine and the long water. Only 3 deaths have occurred in the Serpentine, 1 in Regent's Park, and 14 in St. James's Park, in that period. On the long water, no death has taken place. Since the concrete bottom was laid in the lake in St. James's Park no life has been lost, though as many as 50 boys have broken through the ice in the course of a day. One little boy nearly lost his life under the ornamental bridge, and, as several oranges and a number of halfpence were found in his pockets, it was believed that he had been tempted into danger by a number of idle people, who for amusement, threw oranges and halfpence from the bridge upon the ice in order to see the boys break into the water in endeavouring to reach them. That practice has become so common since the depth of the water was diminished, that the authorities in Scotland Yard have been applied to for assistance in putting it down, but they decline to interfere on the ground that the parks are out of their jurisdiction, and that the duty of preserving order attaches to the park-keepers.

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